Socioeconomic position and mass media campaigns to prevent chronic disease

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Keywords

Evaluation, health language, health literacy, health promotion, socioeconomic disadvantage, socioeconomic position, mass media campaign, understanding, chronic disease prevention.

Abstract

Background

Decades of health promotion efforts aimed at changing health behaviour have resulted in improvements in health, but at a slower pace for lower socioeconomic groups than for their higher socioeconomic counterparts. This slower rate of response by lower socioeconomic groups to health promotion has been said to contribute to a widening gap in health inequality, and mass media health promotion campaigns have been suggested to be a class of interventions that generate health inequality. There is little solid evidence to support these claims, and the methodological rigour of studies that evaluate mass media campaign development and outcomes has been questioned in systematic reviews. The aims of the research presented in this thesis are to ascertain socioeconomic (SEP) differences in mass media campaign outcomes and explore the idea that respondent understanding of campaign messages and language may influence campaign effectiveness. Based on an evaluation framework, the campaign outcomes assessed were reach, understanding and effectiveness.

Methods

The study was conducted in Brisbane in 2010 following the third wave of the televised component of the *Measure Up* campaign, part of the Australian Better Health Initiative (ABHI). A random cross-sectional population sample of 1740 adults aged between 45 and 60 years, comparable with Australian Bureau of Statistics (ABS) 2006 Census population characteristics, was invited to complete a mailed survey (response rate 61.4%). For the survey, respondents reported their education, occupation, and yearly household income as measures of socio-economic status. They also were asked questions for assessing campaign reach, understanding of the campaign messages and health-related terminology used in the campaign, and campaign effectiveness. Campaign reach included campaign awareness, and type and number of media channels to which respondents were exposed. Understanding of the message included items about lifestyle-related chronic diseases, as well as the health effects of these conditions and how they may be prevented. Measures of effectiveness included whether respondents agreed that the campaign had prompted them to measure their waist and weight, increase their daily physical activity and

fruit and vegetable intake, and talk to their doctor about preventing chronic disease. Respondents were also asked whether the campaign had prompted them to visit the campaign website.

Cross-tabulations and chi square analyses were used to initially explore relationships between SEP variables and outcome variables. Multivariable logistic regression modelling was then used to examine the likelihood of respondents from each SEP group being aware of the campaign, being exposed via different media channels, having incorrect answers to knowledge items that addressed understanding of the campaign message and health related terminology, and being prompted by the campaign to engage in healthy behaviours and visit the campaign website. Associations between SEP and continuous outcome variables, namely the total number of media channels to which each respondent was exposed (Media Channel Exposure Index) and a total knowledge score (Understanding Index), were analysed using multiple linear regression. Last, mediation effects of the Understanding Index on the relationship between SEP and being prompted to engage in proximal behaviours was examined using logistic regression modelling.

Results

Reach: In this sample of adults aged 45 to 65 years, 85.8% of respondents were aware of the media campaign, and significant odds of being unaware of the campaign were highest among the least educated, blue collar workers, and respondents with low income. Television was the principal mode of exposure, reaching 93.9% of respondents. Respondents who had a low-middle level of yearly household income were exposed to significantly fewer media channels than were those with a high household income.

Understanding: Compared to the higher SEP referent group, low SEP respondents were significantly less likely to give correct answers to knowledge items about the disease process, health effects and preventative lifestyle strategies. For four of five chronic disease risk factors (CDRF), respondents with the lowest education or yearly household income had significantly lower overall understanding of each of the

CDRF terms. Respondents in the lower socioeconomic groups also showed the least knowledge about the main campaign messages. In all, understanding of campaign terminology was significantly less in lower socioeconomic groups.

Effectiveness: Notably, respondents in all levels of education below a bachelor degree were more likely than those with a bachelor or higher degree to report being prompted by the campaign messages to engage in the proximal behaviours. Significant results included respondents with a diploma or an associate degree being significantly more likely than the bachelor degree or higher referent group to be prompted to increase their physical activity, and to increase their fruit and vegetable intake, and those in middle income groups being significantly more likely to be prompted to measure their waist. Low-middle income groups were significantly more likely to increase their fruit and vegetable intake and talk to their doctor about prevention of chronic disease. There were no significant relationships between occupation and effectiveness. Being prompted by the campaign to visit the campaign website was also considered under campaign effectiveness. The majority of respondents in all SEP groups had access to a computer but few visited the campaign website. Highly significant associations were observed between low SEP and not having access to a computer. There were no significant differences among SEP groups in the percentages of participants who had access to a computer but did not go online.

Contributions of understanding to effectiveness: There was a statistically significant relationship between understanding and effectiveness but little to suggest that this effect differed by SEP. Those respondents with low overall understanding of the CDRF terms were significantly less likely to measure their waist. Those with low understanding of the term 'Overweight' were significantly less likely to measure their weight. Those with low understanding of the term 'Type 2 Diabetes' were significantly less likely to increase their fruit and vegetable consumption. However, those with a medium level of understanding of the term 'Heart Disease' were 45% more likely to increase their physical activity and 150% more likely to talk to their doctor about preventing chronic disease with both odds ratios statistically significant.

Conclusion

Compared to higher SEP groups, low SEP groups experience significantly lower reach and understanding of mass media health promotion campaign information. In terms of effectiveness, statistically significant odds for respondents with middle income compared to high income were prompted by the *Measure Up* campaign to measure their waist and weight. These results suggest that the campaign gained the attention of middle, but not higher or lower socioeconomic groups. Understanding was found to influence respondents being prompted to engage in some proximal behaviours but this did not differ by SEP. In the short term, more work needs to be done to determine the health information needs of lower SEP groups as well as the networks by which information is attained and shared. In the longer term, governments need to deliver upstream provision of education systems that will instil a knowledge base on which health knowledge can be built, and mid-stream, by disseminating educationally sound public health information in a manner and format that attracts and can be accessed, understood and acted on by all population groups. Based on the results of this thesis it appears that socioeconomic differences in response to mass media health promotion campaigns may, by way of lower reach and lesser understanding of health related terminology, widen the gaps in health inequality between socioeconomic groups.

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List of Abbreviations

ABS	Australian Bureau of Statistics
AEC	Australian Electoral Commission
CHD	Coronary heart disease
CDRF	Chronic Disease/ Risk Factor
CI	Confidence Interval
COAG	Council of Australian Governments
CVD	Cardiovascular disease
IRSAD	Index of Relative Socioeconomic Advantage and Disadvantage
IRSD	Index of Relative Socioeconomic Disadvantage
FRE	Flesch Reading Ease formula
FKG	Flesch-Kincaid Grade
LRCD	Lifestyle Related Chronic Disease
MCEI	Media Channel Exposure Index
MU	Measure Up
OECD	Organisation for Economic Cooperation and Development
OR	Odds Ratio
QUT	Queensland University of Technology
RR	Response Rate
SAL	Survey of Aspects of Literacy
SMOG	Statistical Measure of Gobbledygook
T2D	Type 2 Diabetes
SEP	Socioeconomic Position
SES	Socioeconomic Status
TV	Television
UIx	Understanding Index
US	United States of America
WHO	World Health Organisation

Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

QUT Verified Signature

Signature:

Date: 21st March 2014

Ethical Approval

The program of research for this thesis was assessed in conjunction with Chapter 2.1 of the National Statement on Ethical conduct in human Research (National Health and Medical Research Council, Australian Research Council, and Australian Vice-chancellor's Committee, 2007). Using these guidelines covering risk and benefit to participants, the potential for harm, discomfort and inconvenience to participants in the study was considered by the researcher to be no greater than that of normal daily activities. Procedures have been put in place to protect participant confidentiality and hence a Low risk application ensued. Ethics Unit approval was granted on 15th March 2010 (Approval number 1000000199). A Health and Safety Risk Assessment was also completed and relevant Standard Operating Procedures identified.

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Chapter 1: Introduction

1.0 BACKGROUND

1.0.1 SOCIOECONOMIC POSITION AND HEALTH

The association between socioeconomic position (SEP) and health has long been established both between high income and low income countries (Marmot, 2005; Graham, 2009), and within countries, across high income and low income population groups (Marmot, 2007). More recent reviews have reported discordant trends in health inequalities over time (Bleich, Jarlenski, Bell, & LaVeist, 2012). For example, in the US, a narrowed inequality gap in life expectancy, but with a widened inequality gap in diabetes prevalence. Similarly discordance in the UK was demonstrated by a widened inequality gap in life expectancy, but a narrowed inequality gap in the prevalence of hypertension. Despite these findings the evidence for a relationship between low SEP and poorer health is strong, such as illustrated by mortality figures from the European Union that estimate more than 700,000 deaths per year are related to socioeconomic inequality (Mackenbach, Jeerding, & Kunst, 2011). As well, many Western high income countries exhibit staggering examples of health disadvantage due to socioeconomic position. For example, within the UK, the life expectancy for a male in Glasgow can range from 54 years in the most disadvantaged areas, to 82 years in the least disadvantaged areas (Marmot, 2007).

Within Australia, death rates are higher for those living in poorer socioeconomic circumstances, and the percentage decline in avoidable mortality between 1986 and 2002 was lower for this group than those at the higher end of the socioeconomic spectrum (Korda, Butler, Clements, & Kunitz, 2007). Australian Institute for Health and Welfare (AIHW) figures for the period 1997-2001 confirm this trend, showing rates of overall avoidable mortality to be 60% higher for persons ≤ age 75 years living in areas of the lowest socioeconomic quintile, than for persons of the same age living in areas of the highest socioeconomic quintile (Australian Institute of Health and Welfare, 2008). These figures, however, are at variance with those of Page, Lane, Taylor and Dobson (2012) who report narrowing of differences in 1979–2006 mortality rates for Ischaemic Heart Disease between high and low socioeconomic groups for females, and for stroke in males and females. It should be noted, however, that these figures are specifically for cardiovascular and cerebrovascular diseases (CVD) and also span a longer period of time (1979-2006) than those referred to previously (1986-2002). CVD rates remain an important benchmark in public health research health because of their major contribution to mortality in both males and females.

1.0.2 SOCIOECONOMIC POSITION, HEALTH BEHAVIOURS AND RISK FACTORS FOR CHRONIC DISEASE

In developed countries the risk factors, low fruit and vegetable consumption, low physical activity levels, and overweight, together, contribute 14.6% of the mortality attributable to risk factors for chronic disease; tobacco alone contributes a further 12.2%, and alcohol alone a further 9.2% (Yach, Hawkes, Gould, & Hofman, 2004). Risk factor prevalence is strongly associated with SEP (Lynch, Kaplan, & Salonen, 1997; World Health Organisation, 2010). One of the most poignant studies to illustrate these associations was the Whitehall II study in London that found public servants of lower grade employment were not only more likely to have a higher BMI, but they also put on weight more rapidly than those in higher employment grades (Martikainen & Marmot, 1999). This longitudinal cohort was followed for 24 years at 6 yearly intervals during which time unhealthy behaviours such as smoking, alcohol consumption, poor diet, and low levels of physical activity were found to have a strong association with mortality. For example, compared to public servants of higher employment grades, unhealthy diet at baseline was approximately twice as prevalent in public servants of lower employment grades. At the end of the follow up period, the risk factor 'unhealthy diet' was 5 times as prevalent in the lower employment grades (Stringhini, Sabia, Shipley, Brunner, Nabi, Kivimaki, 2010). Adams and White found that more affluent people tended to be 'readier' to make changes to their behaviour than those less affluent. In a rapid scoping review of 21 studies that incorporated patterning of stages of change by SEP for any health behaviour, the authors found that except for the behaviours of cancer screening and smoking, persons who were more affluent were more likely to be in a more advanced stage of readiness to change their health behaviours than those who were less affluent (Adams & White, 2007).

In Australia a similar profile exists. In 2003, proportions of the total disease burden attributable to the combined risk factors, low fruit and vegetable consumption, low physical activity, and overweight, for males was 16.8%, and for females, 15.6% (AIHW, 2008). Tobacco contributed 9.6% for males and 5.8% for females, and alcohol (harmful effects) 4.6% for males and 1.6% for females (AIHW, 2008). The prevalence of overweight, obesity and other risk factors (except for risky/high-risk alcohol use (AIHW, 2008) is higher in the socioeconomically disadvantaged (AIHW, 2008; Atherton & Power, 2007; Galobardes, Costanza, Bernstein, Delhumeau, & Morabia, 2003; Glover, Hetzel, & Tennant, 2004; Winkleby, Jatulis, Frank, & Fortmann, 1992; Martin, Haren, Taylor, Middleton, & Wittert, 2008; Turrell & Mathers, 2001; WHO, 2010). As well, these groups are less likely to undertake behaviours to prevent disease or detect it prior to symptoms occurring (Turrell & Mathers, 2000).

1.0.3 THE SOCIAL GRADIENT AND THE INCREASING HEALTH INEQUALITY GAP

Many of the health behaviours pertinent to the development of chronic disease follow the social gradient, and as such, prevention may be best viewed in the context of social determinants of health (Marmot, Allen, Goldblatt, Boyce, McNeish, Grady, 2010). The middle of the 20th century saw health improving in all OECD (Organisation for Economic Cooperation and Development) countries thought due to better living and working conditions and improved medical care (Marmot, 2007). However, as health improved, it was at a slower rate for disadvantaged than advantaged groups (Marmot, 2007). This differing rate of improvement between socioeconomic groups has come to be known as the widening gap in health inequality (Kawachi & Marmot, 1998). Early notable reports that this gap was widening in the UK include the Black Report, published in 1980. It suggested that differentials in health between socioeconomic groups have been increasing since the beginnings of the National Health Service in 1948 (Gray, [Abstract], 1982). Ten years on, there were reports that social class differences in mortality were still widening (Davey Smith, Bartley, & Blane, 1990), and twenty-five years on, the 2005 figures continue to show that health inequality had worsened (Munro, 2006).

Global reports (World Health Organization, 2008; Goesling & Firebaugh, 2004) and those from the US (Meara, Richards, & Cutler, 2008; Pappas, Queen, Hadden, & Fisher, 1993) and Europe (Mackenbach, Bos, Andersen, Cardano, Costa, Harding, et al. 2003) corroborate this trend, as do sentinel studies in Australia. Comparisons of Australian cardiovascular disease rates for the periods 1985-1987 and 1998–2000 indicate that men of the most disadvantaged 20% of the population compared to the least disadvantaged 20% exemplify the widening gap in health inequality. In the 1985-87 period the most disadvantaged were 1.65 times more likely to die from a disease of the circulatory system (Draper, Turrell, & Oldenberg, 2004). By the 1998-2000 period this likelihood had increased to 2.10.

1.0.4 POPULATION WIDE HEALTH PROMOTION, SOCIOECONOMIC POSITION, AND THE INCREASING INEQUALITY GAP

One of the responses of governments and health promotion authorities to the increasing prevalence of some chronic disease risk factors has been to conduct major health promotion campaigns through a variety of media (Randolph, & Viswanath, 2004; Wakefield, Loken, & Hornik, 2010). Mass media, which usually includes TV, radio, newspapers and other print, facilitates mass communication to the public and does not depend on person to person contact (Reid, 1996). Mass media has the potential to address health attitude and behavioural change across numerous health problems and audiences (Noar, 2006), and it is also thought that the high visual content promotes reach to less educated groups (Roberts & Macoby, 1984).

Despite decades of health promotion campaigns, however, the relative level of health inequality between higher and lower socioeconomic groups continues to increase for some risk factors. Anecdotally, researchers have said that health promotion campaigns may have contributed to the widening of this gap by way of SEP differences in knowledge (Stockley & Lund, 2008), ability to assimilate health messages (Kawachi & Marmot, 1998), retention of knowledge over time (de Walle & de Jong-van den Berg, 2008), and differences in meaningful exposure that leads to differences in comprehension (Niederdeppe, Kuang, Crock, & Skelton, 2008a). As well, a report in a recent review of interventions that generated health inequalities, suggests that mass media health promotion campaigns 'show some evidence' of generating inequalities (Lorenc, Petticrew, Welch, & Tugwell, 2012).

There has been only a small amount of evidence to support the above claims and further examination reveals that different authors are commenting in the main, on the same original information (de Walle & de Jong-van den Berg, 2008; Stockley & Lund, 2008; Lorenc et al., 2012). The Lorenc study included two systematic reviews of mass media campaigns: the first found that anti-tobacco mass media campaigns were often less effective in socioeconomically disadvantaged populations (Neiderdeppe et al., 2008a), and the second, concerning peri-conceptual folic acid consumption particularly in young women and those from lower socioeconomic groups, found that 'campaigns and interventions have the potential to exacerbate socioeconomic inequalities in folic acid use' (Stockley and Lund, 2008). Lorenc et al. (2012), however, did moderate their findings in concluding that "more consistent reporting of differential intervention effectiveness is required to help build the evidence base on IGIs" (intervention generated inequalities). This call for better evidence joins other calls for more methodological rigour (Guillaumier, Bonevski, & Paul, 2012), and standardisation (Bauman, 2000) in mass media campaign evaluation design, particularly of effectiveness in socioeconomically disadvantaged groups (Fagan, 2008; Guillaumier et al., 2012; Neiderdeppe et al., 2008a).

Early sentinel literature on the subject of SEP differences in knowledge acquisition from mass media (Tichenor, Donohue, & Olien, 1970) suggested that as information delivery increases, the acquisition of knowledge is relatively greater in persons of higher SEP than of lower SEP. Further work by this group highlighted that it is the relevance of the knowledge to the person that is of most importance in knowledge acquisition (Donohue, Tichenor, & Olien, 1975). Later, this concept was explored in the domain of health knowledge and prevention of heart disease (Ettema, Brown, & Luepker 1983). The study by Ettema et al., (1983) found that personal threat (of heart disease) is a great motivator of knowledge acquisition and even narrows the socioeconomic differential in knowledge after a mass media campaign. It is also argued that it is the ability to apply knowledge that affects health behaviour. One can acquire knowledge and this acquisition is helped by education (Pampel, Krueger & Denney, 2010), but the major contribution of education is knowing what to do with the knowledge to promote and maintain one's health. "Education ... trains individuals to acquire, evaluate and use information ... to tap the power of knowledge ..." (Mirowsky & Ross, 2003, p 1). There has been little attention given to the issue of understanding either written or spoken health messages, especially in applied settings (Mazor, Calvi, Cowan, Costanza, Han, Greene, et al. 2010).

These ideas, however, are contained in small and often conflicting parts of the literature and are relatively untested. As well, much of the research regarding response to mass media has been performed outside of the health domain rendering very little specific evidence to that domain. Literature reporting SEP response to mass media health promotion campaigns is limited (Fagan, 2008; Guillaumier et al., 2011; Neiderdeppe et al., 2008a), and reporting on SEP response to lifestyle related mass media campaigns is even more scarce (Brown, Soares, Epping, Lankford, Wallace, Hopkins, et al., 2012; Cavill & Bauman, 2004; Kahn, Ramsey, Brownson, Heath, Howze, Powell, 2002; Leavy, Bull, Rosenberg, & Bauman, 2011; Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998).

Thus, this thesis seeks to shed light on associations between SEP and mass media awareness, understanding and effectiveness. More specifically, this research thesis is an inquiry into socioeconomic differences in the awareness and nature of exposure, the understanding of messages and language, and the behaviours or actions taken in response to prompting by a mass media campaign. First it reviews the evidence for claims that socioeconomic groups differ in their response to mass media health promotion campaigns. Then, it evaluates the *Measure Up* national mass media campaign, part of the Australian Better Health Initiative (ABHI), to assess socioeconomic group responsiveness to a campaign aimed at prevention of lifestyle-related chronic disease. In the next section, the research aims and questions are presented, after which the outline of the remaining chapters is described.

1.1 RESEARCH AIM AND RESEARCH QUESTIONS

1.1.1 RESEARCH AIM

The purpose of this study is to examine socioeconomic differences in responsiveness to mass media campaigns, with ‘responsiveness defined in terms of reach, understanding and effectiveness.

1.1.2 RESEARCH QUESTIONS

Main Research Question: *What is the relationship between socioeconomic position and responsiveness to mass media health campaign messages?*

Research Question 1: *What is the relationship between socioeconomic position and reach of a mass media campaign?*

This question examines whether campaign reach differs by participants' socioeconomic position. Reach is determined by participant awareness of the campaign as well as the media channel types by which exposure to campaign information took place.

Research Question 2: *What is the relationship between socioeconomic position and understanding of a mass media campaign message and language?*

This question examines whether socioeconomic groups differ in their understanding of the campaign message and language.

Research Question 3: *What is the relationship between socioeconomic position and effectiveness of a mass media campaign messages in terms of proximal behaviour response?*

This question examines whether socioeconomic groups differ in their reported adoption of healthy behaviours in response to mass media campaign messages.

1.2 THESIS OUTLINE

Chapter 1 has provided a brief background to the relationships between SEP and health. Also in this chapter is a brief summary of the evidence that socioeconomic groups differ in their response to mass media health promotion campaigns. The limited evidence proffered to support claims that mass media may contribute to the widening of the health inequality gap is also discussed.

Chapter 2 presents a review of the literature about the place of mass media in health promotion and its evaluation from a socioeconomic perspective. Factors affecting socioeconomic response to mass media campaigns are discussed followed by a review of reporting from a socioeconomic perspective in mass media campaign evaluations between 1992 and 2012. A statement of the study aim, research hypotheses, and a diagram of the study conceptual model concludes the chapter.

Chapter 3 presents the methods section for the study that describes research design, sample selection, data collection and analysis. As well, the role of the Australian Better Health Initiative (ABHI) *Measure Up* campaign as the medium by which the research questions of this thesis are explored.

Chapter 4 presents the results of bivariate and multivariable analyses that address the research questions. Relationships between SEP and reach, knowledge and understanding, and effectiveness of the *Measure Up* mass media health promotion campaign are presented as well as those addressing the mediating effect of understanding on campaign effectiveness.

Chapter 5 discusses, interprets and evaluates the results with reference to the literature and in terms of the research having answered the research questions.

Chapter 2: Literature Review

2.0 INTRODUCTION

This chapter is divided into six main sections that separately examine two large bodies of knowledge prior to being used in combination to begin to address the research questions in the form of a review of mass media health promotion campaigns. The first body of knowledge is an exploration of mass media health promotion campaigns and their place in population health. The evolvement of the two main types of campaigns is discussed followed by an exploration of theoretical underpinnings using a Social Ecological model. The use of mass media to address health behaviour change at individual, social, and community levels is examined and this is followed by an account of mass media campaign evaluation, theory, framework, methods and outcomes. A framework for use in the current research is also developed and discussed. The next smaller section explores early studies that support a relationship between socioeconomic position and knowledge acquisition from mass media campaigns and links the two large bodies of knowledge.

The second body of knowledge is an examination of the idea that mass media campaigns contribute to the widening of the health inequality gap between socioeconomic groups. The available evidence is examined as well as ways in which inequality might be inbuilt into mass media campaigns. Audience characteristics that may contribute to differences in message penetration are also explored. In the final section, two decades of mass media campaigns promoting lifestyle modifications to prevent chronic disease are reviewed specifically for reporting of socioeconomic differences in outcomes, guided by the study framework.
Lastly, the conceptual model for the study and hypotheses are presented and the section concludes with a chapter summary.

2.1 MASS MEDIA CAMPAIGNS IN HEALTH PROMOTION

2.1.1 OVERVIEW

Mass media campaigns about health related topics are organised purposive projects that utilise a number of media channels to motivate a large population to think about, change to, or maintain behaviours that are health enhancing (Bauman, Smith, Maibach, & Reger-Nash, 2006). Such high profile information has the potential to reach widely dispersed audiences (Noar, 2006; SAGE Knowledge, 2012), difficult to access groups such as young males (Pierce et al., 1986 in cited in Redman, Spencer, & Sanson-Fisher, 1990), and minority groups described in the literature as 'low profile' (Roberts & Macoby, 1984) and 'hidden' (Thorogood & Coombes, 2004).

The actualisation of a mass media campaign may not always be optimal in all respects. Development, planning, and evaluation can be hindered by funding limitations (Bauman & Chau, 2009; Wakefield, Loken, & Hornik, 2010), and delivery can be impaired in the competition for audience attention in a crowded, media environment (Randolph & Viswanath, 2004). Expectations are often unrealistic (Bauman & Chau, 2009), and it is important to keep in mind what mass media campaigns can achieve. The ideas of many authors about what can be expected from mass media campaigns have been summarised into four main points. These ideas include raising awareness about health issues, helping to put health on the public agenda, exerting an influence on one-off choices or simple behaviours, and putting forward simple information (Brown, 1996). This last point is of enormous importance in communication of information to all segments of the population.

In the adaptation of health-related information, a good understanding of population health literacy is required (Frisch, Camerini, Diviani, & Schulz, 2011). Health literacy is a multi-factorial concept based in accessing, understanding, appraising, and applying health information (Sørensen, Van den Broucke, Fullam, Doyle, Pelikan, Slonska, et al. (2012). Health literacy is also described as a set of skills that enables individuals to exercise greater control over their health and many determinants of health, at the individual, social and environmental levels (Ishikawa & Kiuchi, 2010). Moreover, health literacy is considered a major factor in the antecedents of health behaviour (Frisch et al., 2011). Ishikawa & Kiuchi (2010) suggest that health literacy should be considered not only at the individual level but from the perspective of the interplay between individuals and their social environments. Literature regarding consideration of health literacy in mass media campaign evaluation is lacking; however, campaign designs that include formative evaluation may have health literacy in mind when examining audience understanding of the health message.

Design and methodological rigour can vary considerably in mass media health promotion campaigns. There are two main types of mass media campaigns discussed in the literature and it is not always immediately apparent to which type an article refers.

2.1.2 TYPES OF MASS MEDIA HEALTH PROMOTION CAMPAIGNS

Mass media campaigns have been commonly distinguished by being linked or not linked to supportive community programs and resources (Redman, Spencer, & Sanson-Fisher, 1990). Increasingly, those campaigns linked to community programs are being seen as more successful in leading to change in health behaviour (Bauman et al., 2006; Heath et al., 2012; Owen et al., 1995).

Beginning in the 1980s mass media campaigns began as part of community wide prevention programs (Bauman & Chau, 2009). Since then, they have continued in this way, but occasionally a ‘stand-alone’ or ‘media-alone’ campaign has been used as a fore-runner to a community program, and its effects have been separately reported. It is suggested that ‘stand-alone’ campaigns have evolved due to political and fiscal pressures (Bauman & Chau, 2009), but evaluation methods appropriate to each campaign design do not seem to have kept pace. Thus the two types of campaigns have developed with different features, capacities, and supports but are being evaluated using the same measures and being included in the same reviews without differentiation (Leavy, Bull, Rosenberg, & Bauman, 2011).

2.1.2.1 ‘STAND-ALONE’ OR ‘MEDIA-ALONE’ MASS MEDIA CAMPAIGNS

The terms ‘stand-alone’ (Cavill & Bauman, 2004), and ‘media-alone’ (Redman, Spencer, & Sanson-Fisher, 1990) have been used sparingly in early mass media campaign literature, but now appear more frequently (Brown, Soares, Epping, Lankford, Wallace, Hopkins et al., 2012; Wakefield et al., 2010). One reason for this may be that the full scope of campaign design is not always reported, or clearly discernible in published evaluation articles, and national global organisations (WHO, 2000), purposive working groups (Heath et al., 2012), and reviewers (Cavill & Bauman; Bauman et al., 2006) may see a need to differentiate between campaign types.

In a review by Brown et al. (2012) ‘stand-alone’ mass media campaigns are described as those that are implemented alone and rely on mass media only to deliver messages about health behaviour to large composite audiences. The two campaign designs are further distinguished by the Community Preventive Services Task Force, (2012) explaining that ‘stand-alone’ campaigns are not a part of wider multi-faceted intervention programs that include individually targeted health promotion activities, social support structures, and environmental and policy changes. There is however a grey area that mars clear distinction between the two types of campaigns and may become problematic if different qualities or values are attributed to each campaign type because they were evaluated using the same framework. For example, it might be quite inappropriate to use distal outcome measures to assess effectiveness of a ‘stand-alone’ campaign when, unlike a campaign attached to a multicomponent strategy, it was not supported by social resources that might pro-long campaign effects long after the media component has ceased.

There is lacking in the literature a theoretical framework that clearly outlines the differentiating parameters of the two types of campaign. Even with the utility of the above definitions, there is still some confusion in their application. This grey area of campaign support is illustrated by the inclusion in the review of ‘stand-alone’ mass media campaigns (Brown et al., 2012), of at least 3 studies that are clearly documented in the literature to be aided by community and/ or social support. In the study reporting the evaluation of the media component of the “Active Australia” initiative, Bauman et al., (2001) state that the intervention included community level support programs and strategies. In the second example, regarding the Canadian VERB campaign, a number of studies evaluating various outcomes of this campaign suggest that the design does not meet the above ‘stand- alone’ criteria. In the abstract of one article (Huhman, Potter, Wong, Banspach, Duke, & Heitzler, 2005) the authors describe the VERB campaign as a multiethnic campaign combining paid advertisements with school and community promotions and Internet activities to encourage children to be physically active every day. In a later article (Huhman, Potter, Nolin, Piesse, Judkins, Banspach et al. (2010), community/ organisational support and involvement is again illustrated in the partnering of VERB with national organisations such as National Parks and Recreation, and Girl Scouts, and hosting of a VERB related program by about twenty communities. The third campaign included in the Brown et al. (2012) ‘stand-alone’ review and also described in one systematic review (Kahn, Ramsey, Brownson, Heath, Howze, Powell et al. (2002) as ‘stand-alone’, is differently described in the campaign evaluation study (Booth, Owen, & Magnus, 1992). Booth et al., (1992) state that “state and local activities were organised to support the campaign (p 242)” and suggest in the last paragraph that part of the campaign success may have been due to base of community support activities undertaken by local and regional branches of the National Heart Foundation. They also suggested that mass media combined with community based activities might play a significant part in the effective promotion of physical activity to the least disadvantaged.

Clearly these campaigns had significant associations with social and/ or community support structures and are misclassified by their inclusion in the ‘stand-alone’ campaign review by Brown et al. (2012) and for one in the systematic review by Kahn. Readers would benefit from clearer definition of parameters or application of already defined parameters to enable them to discern benefits and disadvantages of each type of campaign. The reviews by Brown et al. (2012) and Kahn et al (1992) both concluded that there was insufficient evidence to support the use of ‘stand-alone campaigns as an effective strategy to promote physical activity. Such conclusions might be more convincing with use of methodological frameworks that clearly distinguish between stand-alone campaigns and campaigns in which the mass media campaign is part of a multi-component intervention.

2.1.2.2 MASS MEDIA CAMPAIGNS AS PART OF BROADER MULTICOMPONENT INTERVENTIONS

Population health determinants exist at many levels (Abroms & Maibach, 2008) and as such, narrowly focussed programs aimed at changing only individual behaviour are least likely to be effective (Stokols, Allen, & Bellingham, 1996a). It is generally accepted that mass media campaigns are best utilised as a backdrop (Cavill, 1998), or part of a comprehensive plan that includes involvement by health professionals and communities to facilitate the healthy behaviours being promoted (Brown, 1996; Cavill & Bauman, 2004, Heath, Parra, Sarimento, Andersen, Owen, Goenka, ... Brownson, 2012; World Health Organisation, 2000).

If the contribution of the mass media component of a supported campaign is to be evaluated, it should be done before support strategies come into play. It is at this point that a framework to guide evaluation of the two campaign types will begin to take on different characteristics because after this time the similarities of the campaigns begin to differ. The different characteristics of the two campaign types should be clearly defined in separate evaluation frameworks. As mentioned above, stand-alone campaigns do not have benefit from the social and community supports that a multicomponent strategy does and as such are not able to be compared using the same framework for both.

To evaluate the capacity of mass media to infiltrate and influence the breadth of society requires an inclusive guiding model. Broader focused strategies and supports that combine individual behaviour, organisational and environmental contexts, regulatory and political enterprise, are essential to improve the health of all population groups (Stokols et al. 1996a). As well, at a policy level, mass media is of value in helping influence public opinion with regards health promoting public policies (Cavill, 1998). Whilst there have been ample mass media campaigns aimed at changing individual behaviours, there are few aimed at either the social or neighbourhood level such as policy in local, state, and national governments (McLeroy et al., 1998).

2.1.3 A THEORETICAL BASE FOR MASS MEDIA HEALTH PROMOTION CAMPAIGNS

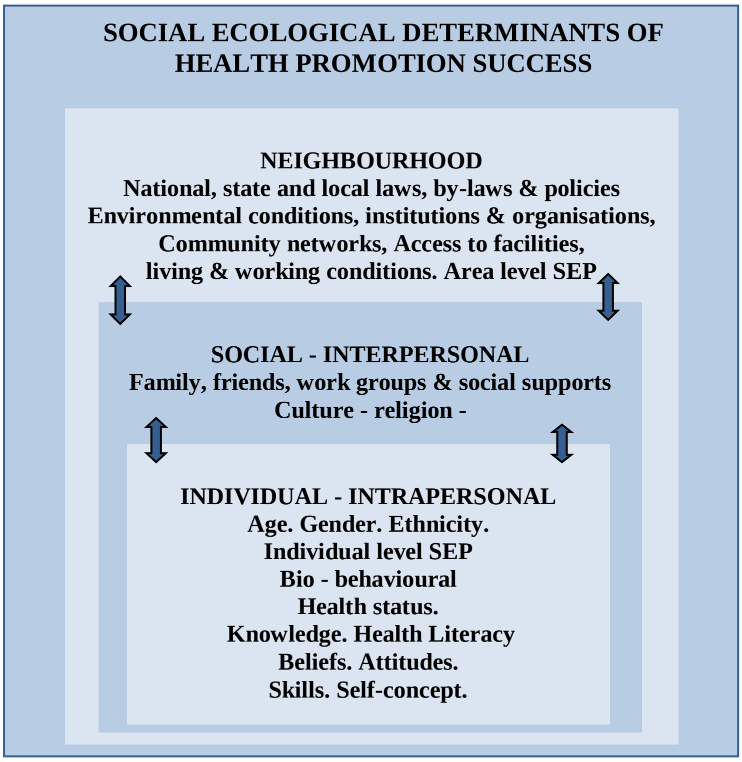
There are great benefits to be gained by the employment of clearly defined and tested theories that promote the integrity of a campaign design (van Ryn & Heaney, 1992). It is essential to recognise that individuals create their own situations in life and ways of living in those situations, and both of these factors influence how long and how well they live (Breslow, 1996). As well, individuals do not live and function in isolation; they are interactive and integral components of relationships, families, and communities, and exist within physical and organisational environments. They therefore exist within a plethora of determinants on their behaviour (Sallis & Owen, 2002).

2.1.3.1 THE SOCIAL ECOLOGICAL MODEL

This section discusses the appropriateness of a social ecological model to guide mass media campaign development and evaluation that comprehensively addresses health behaviour determinants. A social ecological model (Breslow, 1996; Sallis & Owen, 2002) can support and guide planning, conduct, and evaluation of programs that address health determinants in the individual, community and environmental domains. There is ample knowledge (Breslow, 1996) and growing recognition that combined individual, community and environmental interventions are needed for effective behaviour change. Social ecological theory classifies determinants of health behaviour into those pertaining to the person, the person’s interactions with others, and to the person’s interactions with the environment and the laws of the land (Sallis & Owen, 2002). McLeroy, Bibeau, Steckler, & Glanz, (1988) further define factors pertaining to the person as including, but not exclusive to, their knowledge and skills, attitudes and behaviour, biological make-up and self-concept. Factors pertaining to a person’s interactions with others include all those with whom they interact such as their family, friendship and social networks, work group and social support systems such as health professionals. Factors pertaining to the environment and legislation include institutions, organisations and the associated rules and regulations, community networks and health care organisations, and national, state and local laws, by-laws and policies.

A Social Ecological Model (Sallis & Owen, 2002) can also provide a framework for identifying the factors that influence campaign success or otherwise. For example, a mass media campaign planner using a social ecological model can map out factors that determine health promotion success at individual. Social, and community levels that might enable or deter a successful outcome (Figure 2.1). There is, however, little evidence of the use of such models to guide mass media campaign development and evaluation.

Figure 2.1 Determinants of health promotion success: A social ecological model



A social ecological model of health determinants, adapted from Haughton McNeill, Wyrich, Brownson, Clark & Kreuter, (2006); McLeroy, Bibeau, Steckler & Glanz,(1988); Ockene, (2006).

2.1.4 MASS MEDIA EFFECTS: INDIVIDUAL, SOCIAL, AND NEIGHBOURHOOD

2.1.4.1 INDIVIDUAL

Whilst mass media has the capacity to intervene at the above three levels, it is at the individual intrapersonal level that most mass media interventions and evaluations are targeted. Despite debate that there is insufficient evidence to recommend mass media as an effective intervention to increase physical activity (Ockene, Edgerton, Teutsch, Marion, Miller, Genevro, et al. 2007), Wakefield et al. (2010) collated evidence of moderate benefit from mass media campaigns to promote physical activity, healthy food choices, and cardiovascular disease prevention all measured at the individual behaviour level.

2.1.4.2 SOCIAL

Mass media campaigns addressing the more complex societal components are few, and are reported to be large organisational undertakings involving liaison with many community organisations (Mummery, Brown, Trost, & Eakin, 2003). At this level of social support they can no longer be classified as ‘stand-alone’ campaigns. The *10,000 Steps Rockhampton* (Brown, Mummery, Eakin, & Schofield, 2006) and the *10,000 Steps Ghent* (Van Acker, Bourdeaudhuij, De Cocker, Klesges, & Cardon, 2011) campaigns are fit examples of programs that have addressed individual, interpersonal and environmental determinants of physical activity. Evaluation of the *10,000 Steps Rockhampton* campaign included at the individual level, measures of awareness, change in physical activity, and pedometer use (Mummery & Brown, 2009), and at the interpersonal level, the researchers measured the extent of General Practitioner involvement (Eakin, Brown, Marshall, Mummery & Larsen, 2004). In the *10,000 steps Ghent* campaign, similar behavioural measures were reported as well as considerable community involvement measures of program support. Such community organisational support included many activities ranging from the distribution of campaign information to organisation of community events (Van Acker et al., 2011).

A review by Abroms and Maibach (2008) found that mass media addressing the social network determinants of health behaviour tended to focus on support from the existing social ties with close friends and family. One campaign (Thorson & Beaudoin, 2004) directed at the social network level that reached further than family, aimed at increasing ‘health social capital’ by stimulating non-parental adults to support the youth of a community. The campaign was effective in changing individual awareness, and attitudes such as trust and reciprocity towards youth; but there was no change in behaviours such as volunteering and meaningful participation, or encouraging other adults.

2.1.4.3 NEIGHBOURHOOD

Mass media interventions that aim to influence people indirectly through positive changes to places in which they spend their lives have a greater potential for promoting healthy change (Abroms & Maibach, 2008), but little is known about how to use media to positively influence community living and workplace conditions, health care access, and social capital (Niederdeppe et al., 2008a). Review findings have shown that at this level mass media is most commonly used to alter perceived social norms and in particular, alcohol (Abroms & Maibach, 2008). However in Australia, mass media anti-smoking campaigns within a comprehensive program of tobacco control policies such as pricing, bans on advertising and purchase of cigarettes by young people, and creation of smoke-free public places (Wakefield et al. 2010; White, Warne, Spittal, Durkin, Purcell, & Wakefield, 2011), phasing out of sport sponsorship of tobacco, increased education and significantly increased funding for tobacco cessation strategies (Hill, Hassard, & Alcock, 2003), have been very effective measures at this level.

Extricating the effects attributable to the mass media elements of a multicomponent campaign, however, can be difficult (Bauman & Chau, 2009; Redman, Spencer, & Sanson-Fisher, 1990), and many authors (Bauman et al., 2006; Bauman & Chau, 2009; Cavill & Bauman, 2004; Flora, 1989) believe that mass media effectiveness should be evaluated in the short term using measures of proximal impacts and behaviours that can be engaged in immediately. The following section explores literature related to theory, methods, and outcomes of past and current mass media campaign evaluations.

2.1.5 EVALUATION OF MASS MEDIA HEALTH PROMOTION CAMPAIGNS

2.1.5.1 OVERVIEW OF PAST METHODS AND OUTCOMES

Four health behaviours associated with 21st century lifestyles contribute largely to the high prevalence of non-communicable disease across the globe. These behaviours, tobacco use, unhealthy diet, physical inactivity, and the harmful use of alcohol (WHO, 2010) have all been addressed by mass media health campaigns. Of these, the health behaviours recommended best addressed by mass media include diet and physical activity (2010, p.4), but to promote a broad range of methods and in the interest of brevity and minimisation of the repetition that might occur if both physical activity and nutritional campaigns were included, those mass media campaigns that address promotion of physical activity are used as a lens through which to view past mass media evaluation methods and outcomes.

Change in physical activity resulting from mass media interventions in the 1970s and early 1980s was often under-assessed with reports indicating marginal change or no change at all (Iverson, Fielding, Crow, & Christenson, 1985). Changes in later years were also reported as marginal, or falling within levels of chance (Marcus et al., 1998). Success in mass media campaign outcomes has predominantly been in the areas of recall (Cavill & Bauman, 2004; Finlay & Faulkner, 2005; Marcus et al., 1998), increase in knowledge (Cavill & Bauman, 2004; Hillsdon, Cavill, Nanchahal, Diamond, & White, 2001), and attitudinal change (Cavill & Bauman, 2004), but evidence for the role of mass media in population level, short-term (proximal) behaviour change, has been limited (Cavill, 1998; Hillsdon, et al., 2001).

This shortfall in evidence manifests in two ways, both by very little change in physical activity being detected as a result of a campaign (Hillsdon, et al., 2001), and also, by deficits in the research method so that changes are not detected (Cavill, 1998). Only three published studies were found to employ adequate evaluation frameworks for physical activity campaigns (Cavill, 1998). It has also been suggested that evaluations tend to measure more distal variables, such as intention and behaviours that are least likely to change in short-term response to a campaign (Cavill & Bauman, 2004). This observation by Cavill and Bauman supports the need for evaluation frameworks specific to the campaign design mentioned earlier in this chapter.

A more recent review of physical activity mass media campaigns from 2003 to 2010 by Leavy et al., (2011) identified some campaigns with more positive outcomes. The reviewers found that physical activity levels were significantly increased in seven of the fifteen campaigns that measured change in physical activity behaviour. Three of these campaigns were stand-alone campaigns, and four were supported with varying degrees of community support, suggesting that both types of campaign were able to produce significant change in physical activity. When considering the total eighteen campaigns studied in this review, however, only three of the eleven 'stand-alone' campaigns generated significant increases in physical activity, whereas four of the seven supported campaigns achieved this same success. Thus, looking proportionately at the Leavy et al. review, campaigns that are part of larger supported projects do achieve better outcomes. It still remains debatable, whether stand-alone campaigns are being evaluated appropriately, and for achievable outcomes. Tending towards this idea are Bauman et al. (2006) who reiterate the findings of Kahn et al. (2002) in saying, that there were very few mass media campaigns evaluated in isolation to determine their overall effectiveness. It is questionable whether there is a suitable framework to guide such evaluations.

In reality, in the domain of mass media campaigns that promote physical activity, there are minimal standards set for evaluation (Bauman et al., 2006). Reporting and publishing evaluation outcomes can be labour intensive and expensive; thus, time and budget restraints may impair appropriate formative, effectiveness, and process evaluations (Bauman et al., 2006).

The inevitable flow on from deficits in methodological rigour in campaign evaluations means, that the critical information necessary to judge both quality, and whether a public health intervention is worthwhile, is absent from most studies that might be examined for systematic review (Jackson & Waters, 2004). Evaluation models help guide evaluators to consider important elements to be included in program evaluations (Glasgow, 2002).

2.1.5.2 THEORISTS AND EVALUATION FRAMEWORKS

The use of appropriate theory and frameworks in development and evaluation of mass media campaigns can help developers from early inception of the program and throughout development, focus on important issues and dimensions to determine the "real world (p 535)" impact of interventions in a population (Glasgow, 2002). In terms of this thesis, the 'real world' impact concerns whether information will reach across the breadth of society and be understood by those most in need of health information. Formats of campaign outcome evaluations over the past three decades have varied considerably ranging from no evaluation at the population level such as in the Australian *"Life. Be in it"* campaign conducted in the 1970's (Bauman et al., 2006) to the relatively comprehensive evaluation format of the ABHI *"Measure Up"* campaign beginning in 2009 (DoHA, 2010a). Program planners, according to Wallack (1981), need to communicate to evaluators exactly what they want people to know, believe and do, and policy makers and planners need to communicate to the evaluators what they want to know from an evaluation.

Wallack (1981) believed that all mass media campaigns were evaluated in some way, at some point along the process, but with varying degrees of scientific rigour. He suggested that greater rigour would be introduced to the experimental design method of campaign evaluation by the addition of qualitative components that would lead to a more comprehensive picture of the outcomes. Campaigns were seen to have little effect because of the narrow focus on attitude and behaviour change, and appreciation was needed for more long term gradual effects that involve different levels of evaluation (Wallack, 1981).

Evaluations, both informal and formal, should be built into the campaign development process from the beginning and should include obtaining feedback, monitoring decision making, and strengthening weak points as development progresses (McGuire, 1989). Evaluation begins in the preparatory stage of a campaign and continues through the testing phase for acceptability by the target audience, and through post-delivery, when an in-depth inquiry is conducted into how well the campaign was implemented and how successful it was. Wellings and Macdowall (2000) see the process as not linear but cyclical, periodically feeding back for refinement. Effective evaluation needs to be planned for, however, not just tacked on at the end. Lack of early planning to detect change in behavioural outcomes can make an evaluation strategy difficult to implement (Matsudo, Matsudo, Andrade, Araújo, & Pratt, 2006). In estimating long term effects of the Heartbeat Wales program, for example, evaluators found retrospectively that they had underestimated the difficulties involved (Tudor-Smith, Nutbeam, Moore, & Catford 1998). It is proposed that the reason that media programs failed was because of lack of attention to planning and ongoing evaluation throughout the entire process of campaign development (Flay, 1987).

2.1.5.3 OVERVIEW OF THREE EVALUATION FRAMEWORKS

One of the earliest and most frequently referenced proponents of a comprehensive type of evaluation framework for evaluation of mass media health promotion programs was Flay (1987). Believing campaign evaluation to be a sequential process, Flay proposed a 3-phase framework under the headings of 'Pre-production, 'Post-production but Pre-dissemination', and 'Post-dissemination', to be carried out over a lengthy time period. Each phase is comprised of sub-evaluations that provide feedback regarding possible refinements needed before proceeding to the next phase.

The *Pre-production* planning phase includes research into the 'needs, perceptions and language of the target audience', development and testing of concepts and subsequent refinement, followed by pretesting with a sample target audience.

The *Post-production but pre-dissemination* phase includes an assessment of the sample target audience's feelings toward the media program and its efficacy or likelihood of having an effect even though tested in a relatively 'unreal' situation.

The *Post-dissemination phase* includes quantification of the amount and format of media exposure and who the message reaches. Also included in this phase is an Effectiveness evaluation which examines the effect of the media campaign on the target audience and may take a number of forms. Two approaches that are relevant for measurement of effect on health behaviour are firstly, that of simple monitoring, carried out by already established data collection agencies such as an omnibus that might record response to an advertisement, or calls to a "Quitline" in response to an anti-smoking campaign. The second approach is that of scientific enquiry or research design (Flay, 1987) in which for example an intervention group is compared to a non-intervention group and baseline or pre-intervention data are collected by which to compare post-intervention data. The final sub-evaluation in this phase is the Process evaluation defined by Flay to reveal why or why not programs are successful or what it was that made a program work. This not often collected information can inform the development of future campaigns (Flay, 1987; McGuire, 1984).

A more recent framework put forward by Bauman et al. (2006) is more comprehensive, and includes a number of features not included in the model of Flay. Determination of whether the health message is understood by the recipients is an important concept derived from the "Hierarchy of effects" model (McGuire, 1984). In McGuire's model, one of the factors influencing the intended impact of a message on individuals' health attitudes and behaviour, is that they need to understand what the message says (McGuire, 1984). Bauman et al. (2006) also differentiate between outcome variables that are best collected proximally, and those that are best collected distally. This model by Bauman et al. (2006) is also clearly underpinned by social ecological theory addressing individual, social, and community level health determinants at various levels in the framework.

The final framework examined in this review is the RE-AIM framework developed by Glasgow, Vogt, and Boles (1999) for evaluating the public impact of health promotion interventions. RE-AIM is an acronym formed from the five evaluation components, *Reach, Efficacy or Effectiveness, Adoption, Implementation,* and *Maintenance.* *Reach* refers to the percentage and demographic characteristics of the sample population (Glasgow et al., 1999). Evaluation of this dimension informs as to whether the message or program has reached those for whom it was intended and thus illustrates validity and representativeness of the population sample (Dzewaltowski, Estabrooks, Klesges, Bull, & Glasgow, 2004).

The second dimension of RE-AIM refers to the *Efficacy* or *Effectiveness* of a program. *Efficacy* pertains to evaluation of more regimented programs delivered under the guidance of strict protocols, whereas *Effectiveness* lends itself to less controlled delivery in real-world situations (Glasgow, 2003). Mass-media is delivered in real-world situations to whomever is listening or watching at the time of delivery, and as they are going about their usual activities. There is no control over who receives the information or by what medium it is received.

The remaining dimensions of the RE-AIM Model, *Adoption*, *Implementation*, and *Maintenance*, are evaluated at an organisational level (Glasgow et al. 1999). *Adoption* is defined as the degree to which a program is taken up and carried out in organisations such as workplaces, health department, or community settings (Glasgow et al., 1999). The extent of an organisation's adoption of a program can be evaluated by direct observation, structured interviews and surveys. *Implementation* refers to the extent to which the intervention is implemented as intended in the real world. This dimension is evaluating the quality of the delivery and can identify barriers to or aspects of the program that impair delivery. Such data are only briefly reported in papers because of size constraints of journals and in the real world may not be made available. *Maintenance* refers to the extent to which a program is sustained over time and the authors recommend that evaluation of this dimension should be carried out no sooner than two years from implementation of the program (Glasgow et al., 1999).

There is a clear miss-match between the last three dimensions of the RE-AIM framework and the evaluative components of a 'stand-alone' or 'media only' campaign. The first two dimensions *Reach* and *Effectiveness*, are very relevant and frequently comprise the main components of evaluation studies (Brug, Tak, & Te Velde, 2011); the final three are suited to evaluation at the community level.

2.1.6 DEVELOPMENT OF A FRAMEWORK TO EXAMINE MASS MEDIA EVALUATIONS FOR THE CURRENT STUDY

With no suitable framework to guide a review of mass media evaluation studies for the current research, the common elements of *reach* and *effectiveness* are borrowed from the above three models (Flay, 1987; Bauman et al., 2006; & Glasgow et al., 1999). Both the concept of *understanding* the health message, and effectiveness by measures of *proximal* behaviours, are added from the Bauman et al (2006) model. The developing framework is further informed by theory in the domains of health behaviour change (Janz, Champion, & Strecher, 2002), communication (McGuire, 1989), and education (Forehand, 2005; Krathwohl, 2002).

Summaries of the pertinent aspects of the three models are presented in the first three columns of Table 2.1. In the fourth column the current study framework of *Reach, Understanding*, and *Effectiveness* (RUE) develops, the concepts having been drawn from the other three models for their usefulness and appropriateness for evaluation of mass media campaigns.

Table 2.1 Frameworks used in development of thesis framework

Flay (1987)	Bauman et al (2006)	RE-AIM (Glasgow et al. 1999)	RUE
Pre-production (Formative)	**Pre-program**		
Planning research Concept testing Message pre-testing	**Planning:** epidemiological, behavioural, & social assessment. Identification of, supports & potential partners. **Formative:** message development & testing.		
Post-production but Pre-dissemination	**Process evaluation**		
Acceptability Efficacy	Assessing implementation and reach. Identifying barriers and facilitators.		
Post-dissemination (Summative)	**Impact Evaluation:**		
Implementation evaluation: Conditions of implementation Quantity of media delivered		**Reach**	**Reach:** Media channel exposure
Number of target audience reached	Message awareness	% of persons who receive or are affected by a program	**Reach:** Awareness
	Message understanding		**Understanding:** campaign message and language
Effectiveness evaluation: Acceptable to target audience	Beliefs, attitudes, intentions for physical activity.	**Efficacy:** positive and negative consequences. Behavioural and quality of life outcomes.	**Effectiveness:** Prompting of beliefs and proximal behaviours.
Efficacious: Simple monitoring / existing recording systems. Experimental approaches e.g. Using control towns/ cities/ regions.	**Distal Impact:** Physical activity related behaviours. Policy & environmental changes to facilitate same.	**Adoption:** The proportion of settings that adopt a policy or program.	
	Outcome evaluation: Health indicators or health status improved, and community level outcomes influenced.	**Implementation:** The extent to which a program is delivered as intended	
Process evaluation: Why program was or was not effective, & how observed effects were produced.		**Maintenance:** Long term, as well as extent to which the changed behaviour becomes the norm.	

Notes regarding the table: Comparable facets from each framework/ model are located across the table horizontally and are shaded similarly. Facets shaded similarly depict the derivation of components from the Flay (1987), Bauman et al. (2006), and the RE-AIM model (Glasgow et al., 1999) that comprise the RUE evaluation framework (Reach, Understanding, & Effectiveness).

Reach Understanding Effectiveness

The new framework simply put, guides evaluation of Reach in terms of whether and by what channel/s the health message reached the individual; evaluation of Understanding in terms of whether or not the individual understands what the message meant, and Effectiveness in terms of whether the individual changed their early (proximal) behaviour in response to the health message.

2.1.6.1 DEVELOPMENT OF THE *REACH* COMPONENT

In evaluating Reach, the RUE model ascertains campaign or message awareness (Bauman et al., 2006; Flay, 1987; Glasgow et al., 1999) as well as the media channels by which audience members are exposed (Flay, 1987). Reach is also informed by McGuire's (1989) *Communication – behaviour change model* in that the message needs to be communicated via a medium that is used by the target audience.

2.1.6.1.1 MEASUREMENT OF REACH, AND REPORTING IN PAST MASS MEDIA CAMPAIGNS

Campaign reach is measured in two distinct ways. The most frequent is that of campaign message recall, and the least frequent is by calculation of rating points usually provided by a media distribution company. The calculation of rating points is termed 'sender-based' information, and whilst it is the lower cost method of evaluation, does not facilitate evaluators' viewing of the campaign as a whole (Flora, Lefebvre, Murray, Stone, Assaf, Mittelmark, et al. 1993).

Gross Rating Points (GRPs)

GRPs and other variations of potential target audience numbers, such as TRPs (Target Rating Points) and TARPs (Target Audience Rating Points), are conventional units used by advertising researchers for measuring a population's opportunities for exposure to a particular unit of media content (Farris & Parry, 1991). GRPs are the product of underlying estimates of reach and frequency (Southwell, Barmada, Hornik, & Maklan, 2002). One GRP means that 1% of the target audience viewed the advertisment once (Beaudoin, Fernandez, Wall, & Farley, 2007).

Message delivered versus message received

Opportunities for exposure, however, do not constitute actual exposure. The assumption is that if the message is delivered often enough, then individuals have received the message. Despite frequent delivery of the message, the individual may not be there to receive it. Moreover, rating point estimates of potential exposure to the placed advertising lack an evaluative assessment of the quality of attention to the advertising (Hallward, 2008). As a result, measurements may largely overestimate the populations that watch, process and recall the message. In short, counts of how many people are presented with an intervention message is not the same as the dose (or amount) of information that individuals actually receive (Morris, Rooney, Wray, & Kreuter, 2009). Communication scholars have noted that being in the presence of, or measuring the time spent in the presence of, electronic media does not guarantee any meaningful engagement with that media (Southwell, 2002). A US study to investigate what viewers did during TV advertisment breaks found that 28% switched channels to watch two or more shows at once; 66% switched channels during commercial breaks; 23% did something else during commercial breaks; and 52% left the room for any period of time whilst the commercial was screening (Hallward, 2008). Thus, delivery of the media is not necessarily being exposed to that media nor is the target population necessarily being reached by that media.

Exposure

Exposure occurs when people engage campaign content in a basic rudimentary manner (Southwell et al., 2002). For evaluation of exposure, a recognition based task is recommended, generating at least a minimal memory trace (Southwell et al., 2002). For example, exposure was confirmed in one study by asking participants in how many different locations they had noticed a billboard displaying campaign material (Wray, Jupka, & Ludwig-Bell, 2005). Over one third of the exposed respondents had seen at least one billboard.

Media channel exposure

Although for health promotion television is seen as a potentially class free medium in comparison with the print media (Reid, 1994), multiple channels of exposure help messages to stand out in a crowded media environment (Randolf & Viswanath, 2004). A Dutch study of response to a pre-pregnancy folic acid supplement campaign found that women with higher education were exposed to campaign information by more media channels than women with lower education, and that the addition of channels targeted to women with lower education did not improve differences in exposure between the two groups. For example, one of the additional channels was that of campaign posters at bus stops; but women with high education reported seeing folic acid campaign advertisements at bus stops over three times more often than women with low levels of education (van der Pal-de Bruin, de Walle, de Rover, Jeeninga, Cornel, de Jong-van den Berg, et al. 2003).

More research is needed to identify whether socioeconomic groups differ in the media channels by which they are exposed to campaign information, as well as whether they differ by which channels they are likely to be exposed (Nelson, Gallogly, Pederson, Barry, McGoldrick, & Maibach, 2008). Given the resource restrictions in health promotion, this information would be most valuable in planning use of appropriate channels (Nelson et al, 2004). Few studies, however, measure exposure (Randolf & Viswanath, 2004), and research for this thesis has located very little reporting of exposure by media channel.

Recognition

Recognition (sometimes called coded exposure) of television or print media campaign images has been shown to be a highly valid measure of exposure. Recognition on a laptop of previously aired campaign advertisements was significantly higher than recognition of bogus advertisements, and correlated very well with associated Gross Rating Point delivery (Southwell et al., 2002). This method has also been used successfully in face to face interviews for evaluating England's '*Active for Life'* campaign. Participants' recognition of six main TV images that were used in the campaign 6-8 months previously was used to determine campaign recall. Of the 38% of respondents who could recall the campaign, 5.5% could do so without any prompting, and the remaining 32% were successfully prompted to recall the campaign by recognition of the still photographs taken from the TV advertisements (Hillsdon et al., 2001).

Recall

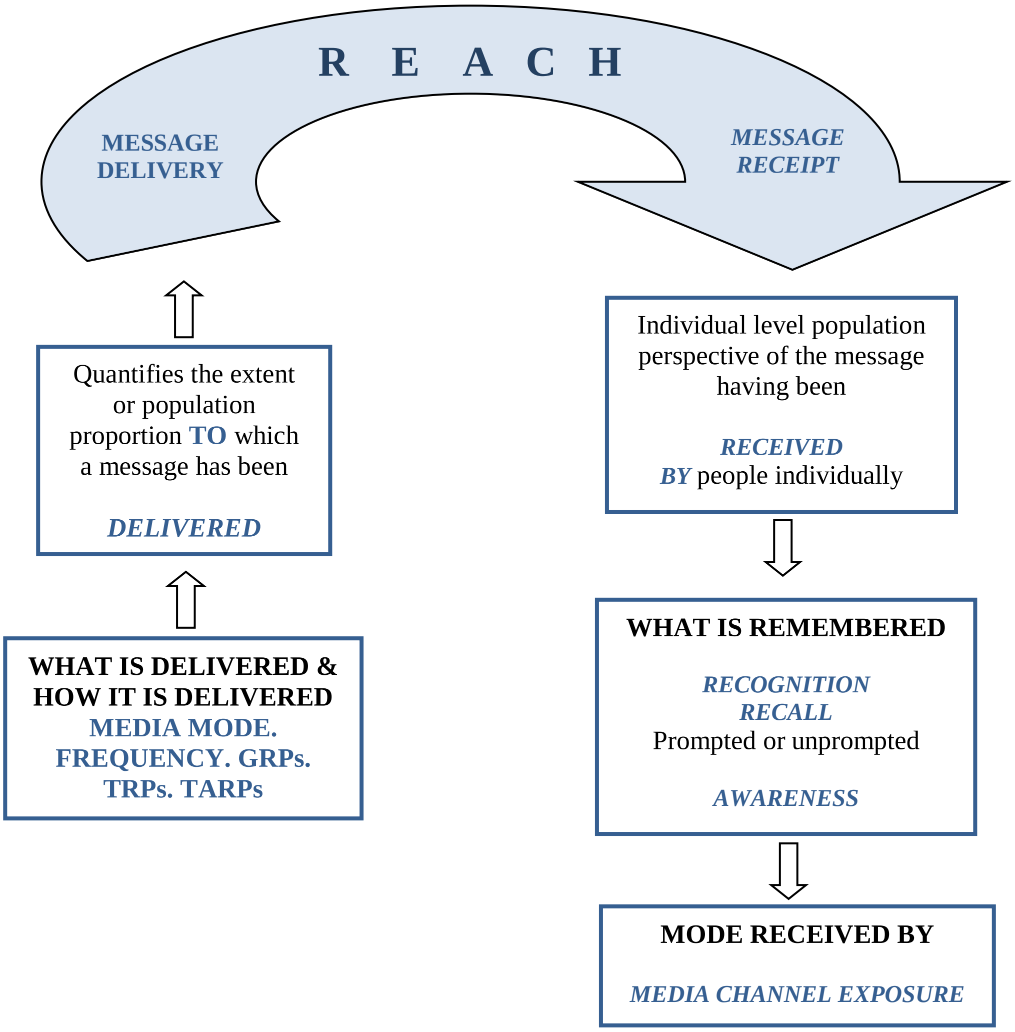
Recall of campaign names and taglines also correlates well with GRPs (Southwell et al., 2002) and is the most frequently used measure in the literature reviewed for this thesis. Recall is a measure of campaign 'awareness' and involves an element of memory where participants are asked to recall various aspects and degrees of subject content. Recall can be unprompted and/or prompted (or similarly, unaided and/or aided).

Unaided (unprompted) recall is elicited by a general question from the surveyor about awareness in the media in the subject area, but providing little or no clue about the nature of the specific advertisement or campaign (Niederdeppe, 2005): for example, "Have you seen, read or heard any messages or advertising for getting kids active? (Huhman, Potter, Duke, Judkins, Heitzler, & Wong, 2007). If the respondent says "yes" or names the campaign, the follow up question is open ended and asks details of the advertisement or campaign that they recall.

Aided (prompted) recall involves a specific question about the content. The surveyor may provide some subject matter or the name or tagline of the campaign (Niederdeppe, 2005). For example, the surveyor might ask, "Have you heard of VERB?" (Huhman et al., 2007). The calculation of rating points is often combined with advertisment recall or recognition (Bauman, Bellew, Owen, & Vita, 2001; Huhman, Potter, Wong, Banspach, Duke, & Heitzler, 2005; Reger-Nash, Bauman, Booth-Butterfield, Cooper, Smith, Chey, et al., 2005; Reger-Nash, Fell, Spicer, Fisher, Cooper, Chey, et al., 2006; Carter & Donovan, 2007), thus providing a comprehensive assessment of reach. Figure 2.2 models distinctions between concepts and terminology related to 'reach'.

On the left of the diagram are depicted terms related to the delivery of the mass media. The terms quantify the proportion of the population to which a message has been delivered. The curved arrow suggests that the message is reaching out to the intended population but is not necessarily received.

Figure 2.2 Modelling 'reach' and associated terminology



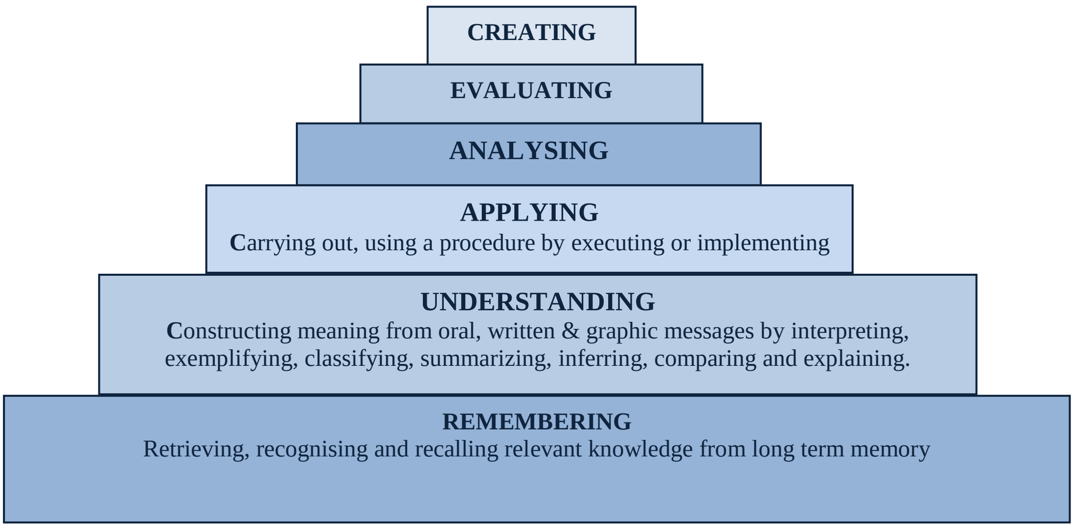
2.1.6.2 DEVELOPMENT OF THE *UNDERSTANDING* COMPONENT

The addition of 'Understanding' (Bauman et al., 2006) to the model is further informed by theories from the domains of communication (McGuire, 1989), and education (Forehand, 2005; Krathwohl, 2002). These models explain the relevance of ensuring (and evaluating) that a health message is understood.

The Communication – Behaviour Change Model utilises communication principles in the design of public education campaigns to effect behaviour change. The dimensions address both delivery and receipt of information in audience response (McGuire, 1989). In the model's 12 step series of events from initial exposure to behaviour change, 'understanding ' secures the important link between a campaign message gaining audience 'interest' and the transition to 'skill acquisition'.

The revised *Bloom's Taxonomy - Cognitive Domain*, a hierarchical model of the thinking learning process (Forehand, 2005; Krathwohl, 2002), contributes an educational, learning perspective. The model depicts a multi-tiered, hierarchical classification of increasingly complex learning behaviours each influenced by the lower level behaviours beneath (Figure 2.3). At the base of the triangle or forming the basis from which to progress to more complex behaviour is 'remembering' or 'knowledge'. Knowledge precedes 'understanding' or 'comprehension', and understanding precedes application of a skill or behaviour. Building on these basic components the learner progresses to the higher skill levels of 'analysing', 'evaluating', and 'creating' (Forehand, 2005). Relevant to the RUE framework are the first three levels, remembering (knowledge), understanding (comprehension) and applying (application).

Figure 2.3 Adapted hierarchical model: New version of Bloom's taxonomy of thinking behaviours in the cognitive domain (Forehand, 2005)



2.1.6.2.1 MEASUREMENT OF UNDERSTANDING, AND REPORTING IN PAST MASS MEDIA CAMPAIGNS

Determining understanding by Formative evaluation

The success of educational materials in promoting behavioural change depends on their understandability and suitability for the intended audience (Bauman, 2000; Carbone, Campbell, & Honess-Morreale, 2002). Message development and pre-testing is usually carried out in the formative development phase of the campaign and is reported as having been performed using a number of methods (Lapka, Jupka, Wray, & Jacobsen, 2008). One method frequently used to determine audience understanding is pilot testing, but this method does not always reveal problems with wording and language (Carbone et al., 2002). The use of cognitive interviews with target audiences has been found to successfully elicit information regarding the understandability of health messages in participants of low socioeconomic position (Lapka et al., 2008). Another common method of testing health messages is the use of focus groups, but whilst the information gained is established from the perspective of participants, the group may lack representativeness (Lapka et al., 2008). The sociodemographic makeup of pre-test groups is rarely defined in evaluation reports (see Table 2.2), so readers are left not always knowing who messages were tested on and whether they were understood by a sample audience of similar sociodemographic attributes as the intended target audience.

In a recent review of mass media campaign evaluations (Leavy et al., 2011) 10 of 18 studies reported formative evaluation of the campaign message. A description of the participants involved in the formative evaluation and pre-testing of those health messages follows (Table 2.2). The far right column indicates whether the socioeconomic profile of the pre-testing group was described. Only two of the 10 campaigns reported this information, and one other did so indirectly by describing the group makeup as ‘mainstream African American’ women.

Table 2.2 Reported descriptions of socioeconomic profile of message pre-testing groups

	Campaign name Author	Description of formative evaluation and pre-testing of campaign message	Described by SEP
1.	*Active Omaha* Huberty et al., 2009	Qualitative focus group with exercise physiologists and health professionals at the organisational level.	no
2.	*Push Play* Bauman et al., 2003	Consultation with numerous population groups.	no
3	*Get Up and Do Something* Peterson et al., 2005	Message pre-test group described by ethnicity, gender. Recruitment from a college campus suggesting no pre-testing on lesser educated groups.	no
4	*Wheeling Walks* Reger-Nash et al., 2005	Formative evaluation and message pre-testing was performed but no further detail given.	no
5	*WV Walks* Reger-Nash, 2008	Participatory planning groups described as 'motivated stakeholders' in rural and urban areas	no
6	*Walk Missouri* Wray et al., 2005	Formative research focus group: mean years of Education 14.3 (8-16+). Household Income range: 30,000-39,999 Pre-test focus group: mean years of Education 14.5 range (9-16+). Household Income range: 30,000-39,999.	yes
7	*Steps* Beaudoin et al., 2007	Media message development consisted of 2 focus groups who were all African American, half of whom were overweight. Target audience was mainstream African American women.	Yes (indirectly)
8	*Start. Living. Healthy* Buchthal et al., 2011 Maddock et al., 2008	Formative research included both blue and white collar but not persons at or below the poverty level. Clerical, skill & trade workers. Primary focus was 'Stages of change theory'.	Yes
9	*10,000 Steps Rockhampton* Brown et al., 2006 Mummery et al., 2003	Developed in conjunction with residents, key informants and local groups/organisations. Background of residents not described.	no
10	*Stay Active Stay Independent* John-Leader et al., 2008	Message development used 3 focus groups of older people. Sociodemographic attributes not described.	no

Measuring Understanding as a component of Impact evaluation

Theorists have modified and expanded Flay's (1987) original evaluation framework and one inclusion has been that of 'understanding' as a component of impact evaluation (Bauman et al., 2006). Change in participants' knowledge and understanding, however, is rarely reported (Cavill & Bauman, 2004), and literature reviewed for this study revealed only three campaigns in which understanding was definitively ascertained (Huhman et al., 2005; Leavy, Rosenberg, Bull, Corti, Shilton, Maitland, et al., 2012; Pollard, Miller, Daly, Crouchley, Lang, & Binns, 2007). Measurement and reporting of understanding in the '*VERB*' campaign (Huhman et al., 2005) was planned, measured using open ended questions, and reported as understanding, but in combination with recall of the campaign. Options reported included 'Recall of campaign without understanding', 'Aided-recall of the campaign with understanding', and 'Unaided-recall of the campaign with understanding', thus not reported as an entity in itself.

In the Western Australian '*Find Thirty. It's Not a Big Exercise'* campaign, understanding was measured as part of the outcome labelled 'Intention'. Respondents who were aware of the campaign were asked what they understood the message to mean, and those who understood the message were asked how personally 'acceptable' (reported as 'acceptance') they found it, and whether they 'intended' (reported as 'intention') to do something in response to the message' (Leavy, 2012). Again, understanding was not reported as a single entity.

An excellent example of how understanding can be measured is illustrated in a relatively recent report from a Western Australian campaign to increase fruit and vegetable consumption (Pollard et al., 2007). The level of knowledge recall measured by this campaign was that of remembering the recommended serving sizes of two fruit and five vegetables per day. Understanding was measured by whether or not the individual perceived that they needed to increase their intake.

Other evaluation reports have provided descriptions of data measurement and reporting that lacked clarity. For example in the BBC's *"Fighting Fat, Fighting Fit"* campaign (Wardle et al., 2001), as part of determining campaign awareness, respondents were asked in an open ended question "Could you say what the campaign was about?" This question was very similar to that in the VERB campaign although, it was unclear as to the level of response required by the researchers. It was also unclear as to the level of response given by the respondents. As the question was most likely part of ascertaining unprompted exposure, answers may have been coded simply with one word answers such as 'overweight' in order to confirm that respondents were aware of the correct campaign. However, the authors also made reference to respondent's understanding the message. Because of this reference it is unclear whether this campaign sought to determine respondent understanding of the campaign message as an outcome in itself. Understanding has been measured in different ways and using different terms.

Understanding the concept

Questions that do address understanding are occasionally included for specific purposes. Examples of this usage include ensuring that respondents knew what was meant by 'moderate physical activity' (Bauman, Mark, Miners, Wallner, & Westley-Wise, 1999), and in a Dutch study the insertion of the statement "Don't worry about your weight" into a list of options to explore whether participants had not misinterpreted the *"Don't get fat"* campaign title (Wammes, Oenema, & Brug, 2007). These questions were not specifically reported by the authors as an assessment of understanding, but were there to make sure the participant did not misunderstand.

Understanding the language

The misunderstanding of health language may not be uncommon. Indeed, one US qualitative study of 24 socioeconomically and ethnically diverse women older than 50 years found that the beliefs of the women about cancer were steeped in over-simplifications, distortions and inaccuracies (Denberg, Wong, & Beattie, 2005). The study showed that even though patients and physicians shared a common vocabulary, they understood differently the relatively common terms 'cancer', 'screening, and 'prevention'. They were in fact 'talking past each other' and this affected patient decision making. Mazur (2000) has called for examination of the methods used to explain concepts to patients and address the issue of what constitutes substantial understanding.

Understanding the message

A recent exploratory study by Dale and Hanbury (2010) found that rather than general information in mass media campaigns, participants wanted more specific information, for example, what constitutes 'good' and what constitutes 'bad' on food labels. This could be interpreted as a desire to understand enough to be able to make decisions. Similarly, in a qualitative study (Carter, Pollard, Atkins, Milliner, & Pratt, 2010) of the Western Australian Go for 2&5 campaign, focus group participants reported, *"We're not told why – we're just told",* and *"How do we know that 2&5 is the best anyway?"* These comments could have been a cry for more information so as to understand. Zhang and Wolfram (2008) studied health consumer search terms about obesity over a one year period made to an online public health consumer portal in 2005. They used visual analysis of the transaction log to identify patterns and consumer health information needs in an attempt to find out what health consumers wanted to know. Health consumers in their searches were most concerned about diet and high blood pressure when searching about obesity (Zhang & Wolfram, 2008), which suggests a desire to know how to prevent or treat the condition and to know about the health effects of being obese. In the current thesis, understanding was examined in a national mass media health promotion campaign in terms socioeconomic differences in understanding the health language used, and the message delivered.

2.1.6.3 DEVELOPMENT OF THE *EFFECTIVENESS* COMPONENT

In the RUE framework, measurement of campaign effectiveness is determined by reports of impact or short-term behaviour change which reflect immediate or proximal responses to the campaign (Cavil & Bauman, 2004).

2.1.6.3.1 MEASUREMENT OF EFFECTIVENESS, AND REPORTING IN PAST MASS MEDIA CAMPAIGNS

Little is known about the long term effects of mass media campaigns on behaviour change, even after two decades of this format of health promotion (Cavill & Bauman, 2004; Frank, Winkleby, Fortman & Farquhar, 1993). Behavioural outcomes take a long time to show a significant effect (Wellings, 2000), with some successful campaigns taking up to 3 years (Reid, 1996). The available evidence indicates limited (Marshall, Owen, & Bauman, 2004; Merzel & D'Afflitti, 2003; Owen, Bauman, Booth, Oldenberg, & Magnus 1995) to moderate (Wakefield et al., 2010) impact of the campaigns on lifestyle related behaviour. Changes are usually small and difficult to measure (Reid, 1996), and the effects contributable to mass media are difficult to isolate when many are also associated with community program components (Wakefield et al., 2010).

Integration of scientific rigour into campaign evaluation can be challenging when the whole population might have been exposed to a mass media campaign (Wellings & Macdowall, 2000). Evaluations that employ pre-post designs and use a control or reference group are more likely to detect change (Snyder, 2007). Only in a few campaigns are the same participants followed through from beginning to end. In the campaign evaluation review for this research thesis only 6 studies followed up the same participant cohort. The remainder were population samples randomly selected at both pre-test and post-test for pre-post comparisons or post-campaign estimations of campaign response.

Outcome measures

Outcome measures are determined by the objectives of the intervention (Wellings & Macdowall, 2000), so there is no standardised method or comprehensive method (Rimal et al, 1999) of evaluating campaign effectiveness for either comparison of the intervention with another or in terms of promoting a comprehensive lifestyle prescription. Change in exercise or physical activity behaviour is mostly measured by change in amount of time spent walking, but in some studies it is measured by change in leisure time physical activity, pedometer step counts, registering for lifestyle programs, or sedentariness. Improvement in diet is mostly measured by increase in fruit and vegetable consumption, and decrease in snack, junk and fatty food consumption. Psycho-social outcomes may include change in intentions regarding lifestyle habits, confidence to overcome barriers, self-efficacy, attitude, knowledge or understanding, and beliefs about benefits of healthy lifestyle. In more recent campaign evaluations participants are asked whether they visited the campaign website (DoHA, & Woolcott Research, 2007) or website hits are measured (Carter, Donovan, & Jalleh, 2007).

Measurement of equality in effect

A comprehensive, forward looking evaluation strategy would include evaluation of effectiveness outcomes across the socioeconomic spectrum, but reporting of inequalities is an area often overlooked by researchers (Armstrong, Waters, Moore, Riggs, Cuervo, Lumbiganon, 2008). To date, arguments for a systematic approach to evaluation of mass media health promotion campaigns (Flay, 1987; McGuire, 1984; Bauman, 2000) have not included measurement of outcomes by SEP. This omission is despite the power of mass media to reach across the socioeconomic spectrum (Noar, 2006) and the notable importance created by high prevalence of lifestyle related risk factors and chronic disease in the lower socioeconomic groups (Winkleby, 1992; Choiniere, 2000; Turrell & Mathers, 2001; Galobardes, 2003; Atherton, 2007; Martin, 2008; AIHW, 2006; WHO, 2010).

The lower acquisition of knowledge from mass media campaigns by lower socioeconomic groups has been recognised and debated for some decades (Gaziano, 1997), and was formalised in early work by Tichenor et al. (1970), who suggested that information uptake is achieved more rapidly and to a greater degree by persons in higher than lower socioeconomic positions (Tichenor et al., 1970). This field of literature will be explored in the next section.

In summary, mass media campaigns for physical activity either because of early limited campaign success or early limited quality of evaluative method, have not had encouraging outcomes. The success of reviews are dependent on the employment of methods that facilitate appropriate measurement and reporting of study outcomes. Early and recent authors and reviewers, however, continue to query methodological quality and representation of all socioeconomic groups. Readers might rightly struggle with the clarity of the minimal theory that there is in this field to assist the assessment and value of the evidence of campaign quality, and whether it can be extrapolated across all population sectors.

2.1.7 MASS MEDIA CAMPAIGNS, KNOWLEDGE ACQUISITION, AND SOCIOECONOMIC POSITION

Exploration of the socioeconomic differential in knowledge acquisition and mass media input was carried out in the 1960s in the area of public affairs in the US. Studies that had reported associations between education and knowledge, were examined as to whether the gap between higher and lower socioeconomic groups changed with increasing amounts of media input (Tichenor et al., 1970). This review contributed to the development of their 'Knowledge Gap Hypothesis':

> " As the infusion of mass media information into a social system increases, segments of the population with higher socioeconomic status tend to acquire this information at a faster rate than the lower status segments, so that the gap in knowledge between these segments tends to increase rather than decrease (p 159)"

A number of contributory reasons were postulated by Tichenor et al. (1970) as to why a knowledge gap would appear, and increase with greater levels of media input. These reasons included:-

i) Those with higher levels of education would have greater reading and comprehension abilities to assist knowledge acquisition.

ii) Existing knowledge from prior exposure or formal education would make persons more aware of a topic and thus better able to understand it.

iii) A broader sphere of activity generally accompanies a higher level of education increasing reference groups and personal contacts with the greater likelihood of discussion of a broad range of topics.

iv) Selective exposure to topics either voluntary or due to educational differences.

v) The media channel by which information is delivered, such as the more frequent exposure of print media to higher educated persons.

Further studies carried out in small communities by the Tichenor group led them to reconsider and modify their earlier hypothesis, which was based on studies examining knowledge acquisition of national public affairs. When they studied local issues, however, they found different forces at play (Donohue et al., 1975). Results indicated that when an issue was local, aroused basic social concerns, and involved conflict, the salience of the factors increased interpersonal communication, motivated knowledge acquisition, and equalised the gap (Donohue et al., 1975).

Using the findings of the Donohue group, Ettema et al. (1983) also built a conflicting case to the earlier findings of Tichenor et al., (1970) citing studies in which the knowledge gap had narrowed for lower socioeconomic groups. Ettema and Kline (1977) had suggested previously that widening or narrowing of the gap in knowledge acquired from mass media information was more likely related to interest and motivation than it was to information processing skills. Ettema et al (1983) tested this idea from a health perspective using comparison and treatment community data from the Minnesota Heart Health Program. They compared the degree to which the socioeconomic gap widened between two population groups. The first group differed from the second in that they were motivated by the perception that cardiovascular disease was an immediate threat. Findings indicated that motivational factors (age and perceived threat) were significant but modest predictors of knowledge acquisition post campaign, but not before the campaign when the information was not so readily available (Ettema et al., 1983). These findings suggest that there is a case for making information readily available through mass media and informing people of its relevance to them. Ettema et al., (1983) also suggest that persons of lower SEP may not have known or understood the significance of the immediate threat because of an inadequate basic health knowledge but were guided by the Minnesota Heart Health Program as to the knowledge they needed to acquire, and subsequently did so.

More recently, informed by the Knowledge Gap Hypothesis, Niederdeppe (2008c) explored socioeconomic group differences in information seeking about cancer immediately after news of celebrity cancer events. He found that SEP differences in information seeking were partially explained by greater health knowledge and greater community involvement of the higher SEP groups.

SECTION SUMMARY

This section of literature has presented an overview of the place and evaluation of past and current mass media campaigns in health promotion as well as the development of an evaluation framework for the review of campaign evaluations in the current research thesis. In addition, two major themes evolved. Firstly that the methodological problems associated with evaluation of mass media campaign success possibly impair the accurate reporting and interpretation of results. Secondly, that attention to mass media campaigns may depend on the salience of the information as well as baseline knowledge and thus may not reach all segments of the population equally creating gaps in the knowledge acquired.

2.2 SOCIOECONOMIC POSITION, MASS MEDIA CAMPAIGNS, AND HEALTH INEQUALITY

The patterning of media use differs by SEP (Viswanath, & Ackerson, 2011), as do the ways in which people take notice of, and take up health information (Viswanath et al., 2006b). As such, it appears that the distribution of the benefits of health information are unequal, paralleling inequalities in health (Viswanath, K., & Ackerson, L. K. (2011).

2.2.1 EVIDENCE OF INEQUALITY AND THE CONTRIBUTION OF HEALTH PROMOTION CAMPAIGNS TO THE WIDENING HEALTH INEQUALITY GAP

Global studies of population trends in coronary heart disease (CHD) (Bajekal, Scholes, O'Flaherty, Raine, Norman, & Capewell, 2013; Kawachi, Marshall, & Pearce, 1991; Korda, Butler, Clements, & Kunitz, 2007; Marmot, Adelstein, Robinson, & Rose, 1978; Wing, 1988) provide strong evidence of a widening inequality gap in the prevalence of CHD rates in most developed countries. A significant point in the conclusions of Kawachi and Marmot (1998), however, that health promotion campaigns have contributed to the worsening of that gap (Kawachi & Marmot, 1998) is supported only by fragmented, mixed and anecdotal evidence that still draws disagreement over the value of mass media campaigns twenty-five years later (Heath et al., 2012; Lorenc et al., 2012). Following is a summary of this evidence.

2.2.1.1 CAMPAIGNS TO PREVENT CORONARY HEART DISEASE

The contribution to the inequality gap by health promotion campaigns is explained in an earlier article by Kawachi, Marshall, and Pearce (1991). They suggest that the 'general impression' is that lower socioeconomic groups less readily assimilate health education messages about preventing coronary heart disease than do higher socioeconomic groups. The authors of this paper do not, however, provide reference to studies that substantiate this impression. Kawachi et al. also cite an additional pathway proffered by Wing (1988), that lower socioeconomic groups are specifically targeted with unhealthy information. Wing believes that at the same time lower socioeconomic groups are being reached less by health education messages, they are increasingly being targeted by the marketing efforts promoting tobacco and high fat foods. This idea has significant support from studies examining tobacco marketing research that promotes targeting of the working class and women who are socially disadvantaged (Barbeau, Leavy Sperounis, & Balbach, 2004). The tobacco industry, even in recent years has promoted cigarette smoking as a sign of emancipation for women, and a symbol of social acceptability, thus, as a way of elevating women (Amos & Haglund, 2000), and the working class (Barbeau et al., 2004). This avenue of effect of mass media in contributing to inequality is a stronger argument than that put forward by authors who proffer "general impressions" backed by referred authors whom are rarely backed by actual supportive studies. There is a series of studies, however, that offer good support for the argument that mass media health promotion campaigns contributes to the widening inequality gap. These campaigns were conducted in the Netherlands to promote peri-conceptual consumption of folic acid.

2.2.1.2 CAMPAIGNS TO PROMOTE PERI-CONCEPTUAL FOLIC ACID SUPPLEMENTATION

De Walle and de Jong-van den Berg (2008) also suggest that mass media campaigns contribute to the widening of the health inequality gap. They reviewed a series of studies that depicted the long term decline of peri-conceptual folic acid supplementation over 10 years following a mass media campaign. They argued that the effects of the Netherlands government funded campaign were not sustained over the 10 years since the campaign, and, increased the inequality gap. Higher educated women retained the knowledge more effectively over time than did the less educated women, thus increasing the gap. Their point was that even though the targeted campaign equalised the consumption of folic acid between lower and higher educated thus reducing the gap in the short term, the one-off campaign did not provide the means to sustain the knowledge transmission to future pregnant women. It was argued that counselling by health professionals and pharmacy stickers on contraceptive pill packets would be more ongoing, longstanding, and effective interventions.

Conclusions from a systematic review of folic acid supplement use, that campaigns and interventions have the potential to increase socioeconomic inequalities (Stockley and Lund, 2008), are based primarily on the same series of studies in the Netherlands (de Walle & de Jong-van den Berg, 2008; van der Pal-de Bruin, de Walle, de Rover, Jeeninga, Cornel, de Jong-van den Berg, et al., 2003), and an Australian study (Williams, McHenery, McMahon, & Anderson, 2001) that looked at the lower knowledge increases in low income women that resulted from the placement of health claims about folic acid on cereal packets. Stockley and Lund point out that inequalities between higher and lower educated women were exacerbated during the Dutch campaign because of a difference in knowledge, but when an additional campaign targeted at lesser educated women was included, folic acid consumption increased from 16.8% to 48.6%. The narrowed gap between lower and higher educated groups was smallest throughout the campaign but was not maintained when measured three years later. This was evidenced by the use of peri-conceptual folic acid in 50% of lower educated women compared to 80% of higher educated women (de Walle, Cornel, & de Jong-van den Berg, 2002).

These findings cannot be seen so much as evidence that mass media increases health inequality but more as an illustration of the disparity in reach, understanding and effectiveness that will occur if planning to reach all socioeconomic groups is not included in the study design. Low SEP women need to be targeted with information that they can understand so as not to be left behind.

2.2.1.3 CAMPAIGNS TO PROMOTE SMOKING CESSATION

There is a large literature concerning mass media campaign success in addressing smoking cessation, however, research examining this response by SEP is limited (Guillaumier et al., 2012; Niederdeppe et al 2008a). Studies included in systematic reviews differ considerably in terms of study design, intervention, duration, content, evaluation time and methods (Bala et al., 2012), as well, there are often too few studies containing the required information to include in a systematic review (Fagan, 2008). Such heterogeneity limits pooling of results (Bala et al., 2012) and may impair the strength of review outcomes. As well, such paucity of information should be stated in terms of what the review does not include or have sufficient information to report on. For example, in a review by Bala et al (2012) in which minimal attention was given to socioeconomic group differences, it was reported that there was no consistent association found between gender, age, ethnicity, and education, and mass media campaign effectiveness. The problem of reporting outcomes on minimal information is further evident in an evaluation report of the *Australian National Tobacco Campaign.* This report illustrates how limited commitment to collection of specific socioeconomic data can result in non-specific outcomes. Hassard (1999) reports a lack of continuity in design philosophy between the conduct of the campaign and the subsequent evaluation, conceding that despite the campaign and media placement being targeted at blue collar workers, the evaluation design did not specifically focus on socioeconomic group outcomes (Hassard, 1999). The campaign was reported to be recognised and recalled similarly by all socioeconomic groups.

More conclusive results can be found when mass media campaigns are designed, executed and evaluated with a socioeconomic focus such as demonstrated in a large US anti-smoking campaign called *'EX'* (Vallone, Duke, Mowery, McCausland, Xiao, Costantino, et al. 2011). Extensive formative evaluation was conducted in the development of this mass media campaign targeting low income and blue collar smokers of a variety of ethnic and cultural backgrounds. Confirmed campaign awareness was found to increase favourable smoking cessation related thinking, and attempts to quit smoking, among those whose education was less than high school.

Mass media campaigns aiming to combat tobacco use, however, may also unintentionally increase or maintain existing SEP inequalities in smoking rates, and mortality from smoking related illness (Niederdeppe et al., 2008a). Socioeconomic groups can differ in meaningful exposure to campaigns due to differences in their comprehension and retention of the media messages, differences in motivational response, and differences in opportunity and support to act or maintain actions (Niederdeppe et al., 2008a; Viswanath, 2006a).

SECTION SUMMARY

Anecdotal evidence appears to be saying that mass media campaigns contribute to widening health inequality by way of campaign reach and audience understanding. Compared with higher SEP groups, lower socioeconomic groups:

- less readily assimilate health education messages;
- are being reached less by health education messages;
- retain their knowledge less effectively over time;
- need to be targeted with information that they can understand; and,
- differ in their comprehension and retention, motivational response, and opportunity to act and obtain support.

2.2.2 EVIDENCE QUALITY

Large systematic reviews are one of the ways in which authors have attempted to establish the population level response to mass media campaigns aimed at reducing a variety of health risk factors. Even in the large amount of literature that is reviewed, however, with the exception of some anti-tobacco campaigns, for example Vallone et al. (2011) information regarding socioeconomic response to campaigns is often found wanting or is not collected. A recent large review of evidence for effectiveness of interventions to promote physical activity has recommended mass media campaigns to be an effective approach (Heath et al., 2012). The review, however, only discussed those campaigns that had positive outcomes and as well, did not examine the studies in socioeconomic terms.

Another recent review, however, conducted with the purpose of finding interventions that actually 'generated' health inequalities among socioeconomic groups, reported that mass media health promotion campaigns 'show some evidence' of doing so (Lorenc et al., 2012). The review included two systematic reviews of mass media campaigns, one for anti-tobacco campaigns (Niederdeppe, 2008a), and one for peri-conceptual folic acid supplementation (Stockley & Lund, 2008) (both discussed above). The authors concluded that "more consistent reporting of differential intervention effectiveness is required to help build the evidence base on IGIs"

(Intervention generated inequalities). Thus whilst systematic reviews are, in theory, an excellent method of amassing evidence about a topic, they are totally dependent on the availability of appropriate evidence, representativeness, quality, and comparability of the studies that are included in the review.

2.2.3 INEQUALITIES IN THE PLANNING, DELIVERY, AND EVALUATION OF MASS MEDIA HEALTH PROMOTION CAMPAIGNS

The relationship between SEP and health inequality appears to be a global phenomenon. It is suggested that this may be due to the very interventions that are aimed at, and successfully do, improve the overall health of populations (White, M., Adams, J., & Heywood, 2009). The review by Lorenc et al. (2012) supports this idea but is based on less than optimal evidence. Inequalities may be introduced at all stages of a delivery system and can be conceptualised into two main contributing components; inequalities in planning and delivery, and inequalities in reach and effectiveness (White et al., 2009). This section will discuss the first of these components, the planning and delivery of mass media health promotion campaigns. The second component, inequality in reach and effectiveness, is integrated into the latter part of this chapter.

2.2.3.1 PLANNING

Inequality can be unintentionally built into a mass media campaign from its inception (White et al., 2009). Mindfulness of such a potential is an important premise from which to progress all campaign development activities. Basing planning on a theoretical model that recognises the links between physical and social circumstances across all population sub-groups and settings (Stokols, 1996b) is appropriate for this task. The high prevalence of low health literacy in lower socioeconomic groups (Australian Bureau of Statistics, 2006), for example, can impair a needs assessment process from the very beginning by survey recipients not fully understanding the wording in the survey (White et al., 2009). The survey should be developed with possible low literacy in mind. As well, if the appropriate socioeconomic spread of survey participants or focus groups has not been determined, then the outcomes may be biased from the beginning on the basis of literacy (Freimuth, Cole, & Kirby, 2001).

Even though formative evaluation is heralded as ‘the most critical step in the campaign development process’ (Bauman, et al., 2006), literature reporting planning, implementation and results of a formative evaluation is scarce (Finlay & Faulkner, 2005). Formative evaluations are important ‘for gaining insight into the needs, perceptions, and language of the target audience’ (Flay, 1987), and, guided by an appropriate theoretical model, can ensure that in the development of messages, the health behaviours, media preferences, and health literacy needs of lower socioeconomic groups are addressed (Niederdeppe et al., 2008a).

The detailed information required to assess rigour of formative processes across SEP groups is rarely available. The tendency toward low survey response from lower socioeconomic groups (Turrell, Patterson, Oldenburg, Gould, & Roy 2003) also contributes to the lack of available information. But equality in socioeconomic terms in the development of campaigns is still infrequently considered. Illustrating this deficit is a recent systematic review of mass media campaigns addressing physical inactivity (Leavy et al., 2011). The review included amongst its aims the evaluation of the use of formative research to inform campaign design; however, SEP was not examined in the design or outcomes of the included studies (Leavy et al., 2011).

Use of an appropriate theory that underpins the logic of the task, deals with all aspects efficiently, and fits well with the underlying philosophical approach can guide planning and evaluation of the health intervention and determine effectiveness (Glanz, Rimer, & Lewis, 2002). As well, based on the moral and social importance of the inequality gap, the appropriate theory must consider reduction of this gap. One Canadian campaign illustrates such an application in campaign planning, quite effectively. The intervention aimed to improve heart health without increasing the inequality gap between rich and poor (Paradis, O'Loughlin, Elliott, Masson, Renaud, Sacks-Silver, et al. 1995). The development model used in the Canadian heart health campaign, ‘Coeur en santé St-Henri’ was based on the PRECEDE-PROCEED Model, and integrated two theories, the Theory of Reasoned Action, and Social Learning Theory. Interventions were guided by a framework developed from the Ottawa Charter for Health Promotion (Paradis et al., 1995). Developers consulted with and included members of the low income community at each stage of development and evaluation, demonstrating the inclusion of social class, employment status, and cultural values, as determinants of decision making (Paradis et al., 1995). The resulting model included predisposing factors such as SEP, employment and culture; facilitating factors, such as favourable environment, health policy, and local laws and regulations; and reinforcing factors, such as family, friends and peers (Paradis et al., 1995). Whilst this campaign was not a stand-alone mass media campaign, it does demonstrate the application of theory and underlying philosophy to integrate campaign reach to all population subgroups.

In the main, reviewers of methodological rigour in campaign evaluations begin their reports at the sampling stage (Guillaumier et al., 2012). As well, leading authors in the field of mass media program evaluation (Bauman et al., 2006; Flay, 1987; Noar, 2006) have not included terms and concepts of disadvantage, or socioeconomic representativeness in their guidelines for formative evaluation. Terms typically used include ‘target audience’ or simply ‘audience’. The onus is on campaign developers to recognise these explicit omissions and ensure equal socioeconomic composition of their advisory and testing groups.

Another aspect of planning that can introduce inequality is the tailoring of the campaign message. Noted in review findings Adams and White (2007) found that those who were more affluent tended to be at a more advanced state of ‘readiness to change’ a health behaviour, than those who were less affluent. Thus campaign messages aimed at people ready to change would not likely reach those in less affluent groups reach those not at that stage.

2.2.3.2 DELIVERY

Avoidance of inequality can be addressed at many stages in systems that deliver health interventions (White et al., 2009). Mass media campaigns are most educationally effective when combined with or linked to other health promotion strategies (Brown, 1996; Heath et al., 2012), and as such, the use of various modes of delivery may have, for example, circumvented the problem voiced by evaluators of the BBC (British Broadcasting Commission) *'Fighting Fit, Fighting Fat'* campaign (Wardle, Rapoport, Miles, Afuape, & Duman, 2001). In that campaign the mode of delivery was via BBC television and radio outlets; however, the target audience for the campaign, those who were overweight and obese, were predominantly of the lower social classes and did not typically watch BBC television or listen to BBC radio, and thus were not reached as effectively as higher classes (Wardle, et al., 2001).

2.2.3.3 EVALUATION

Just as evaluation is an ongoing process throughout campaign development and implementation, so can inequality be introduced at any stage of the evaluation process if not in the forefront of the minds of developers, or not guided by a comprehensive model. Given the high priority that reduction of health inequality is given by international organisations, national governments and non-government organisations (Brown & Nepal, 2010; DoHA, 2010a; DoHA, 2010b; Graham, 2009, Haroon, 2001; IOM Institute of Medicine, 2012; Moodie, Daube, Zimmet, Cornell, Roberts, Larkin, 2010; WHO, 2008), it is surprising that reporting of outcomes of all interventions in socioeconomic terms is not mandatory. Comprehensive evaluation of equality in campaign reach and outcomes requires clear definitions of where the inequalities exist. Addressing these deficits can be incorporated into targets and frameworks as well as the inclusion of gap reduction as a major endpoint towards which to drive campaigns (Fagan, 2008).

SECTION SUMMARY

This section has provided an overview of the literature regarding relationships between SEP, mass media health promotion campaigns, and health inequality.

Evidence proffered to support the idea that mass media campaigns contribute to the widening of the health inequality gap has been discussed, along with evidence quality. The second part of this section examines ideas that inequality may be introduced into mass media health promotion campaigns from very early in campaign development, as well as in planning and message delivery. The next section of this review explores how factors associated with individuals' SEP may affect their receipt of and response to mass media health promotion campaign messages.

2.3 SOCIOECONOMIC DISADVANTAGE AND FACTORS AFFECTING RESPONSE TO MASS MEDIA HEALTH PROMOTION CAMPAIGNS

Reports of mass media health promotion campaigns aimed at changing individual health behaviour indicate least success among the socioeconomically disadvantaged (Turrell, Stanley. De Looper, & Oldenberg, 2006a; Winkleby, Flora, & Kraemer, 1994). These reports have not proffered a good understanding as to why this is so. Gronbaek (2009) suggests that conflicting health reports have caused confusion among the public at large. Examples include ambiguous reports of the health benefits and non-benefits of alcohol (Gronbaek, 2009), the exaggeration by the media of inconsistencies in advice about food choices (Guttman, Kegler, & McLeroy, 1996; Johnson-Taylor, Yaroch, Krebs-Smith, & Rodgers, 2007), and the implicit conflict of interest in pharmaceutical marketing company sponsored cholesterol awareness campaigns (Hall, 2008). It is difficult for the lay public to sort through these often conflicting messages. Because levels of literacy, numeracy and problem solving are lower in the lesser educated, lower income, unemployed, blue collar and most remote groups (ABS, 2006), another reason may be that the messages of health promotion campaigns are not well understood (Winkleby et al., 1994). Anecdotal comments cited earlier suggest that lower socioeconomic groups need to be targeted with information that they can understand (Stockley & Lund, 2008) because they differ in their comprehension and retention (Niederdeppe et al., 2008a; Viswanath, Breen, Meissner, Moser, Hesse, Steele, 2006b). These ideas are in line with Winkleby et al., (1994) who suggest that low educational groups may not have the knowledge or skills that are required to understand or engage in the promoted behaviour.

2.3.1 INEQUALITY AND ACQUISITION OF HEALTH KNOWLEDGE

Low income is one of the strongest contributors to inequality in health knowledge (Viswanath et al 2006b), resulting in lower SEP groups suffering significant health communication disadvantages (Kontos, Emmons, Puleo, & Viswanath, 2011). Lower SEP groups not only have less knowledge about risk prevention but they also seek less information, and do not receive information as speedily, possibly due to less access to communication channels (Hovick, Freimuth, Johnson-Turbes, & Chervin, 2011). Limitations in access, processing, and use of health information are compounded by low literacy and skills that perpetuate gaps in knowledge and further widen gaps in health inequalities (Viswanath, 2006a). The two main challenges for communication of health information are in the first instance, to convert scientific information into a format that can be understood and used by a range of audiences, and secondly to make sure that the information is available to all who need it regardless of SEP, geographic location or ethnicity (Viswanath, 2006a).

2.3.2 INEQUALITY AND UNDERSTANDING HEALTH INFORMATION

Many factors can influence individuals' access to health information and how well that information is understood. This section discusses some of these factors in terms of their role in affecting differential understanding of health information by socioeconomic groups.

Whilst new technologies and efforts by health professionals to empower patients can facilitate access and understanding for some, they may simply create barriers for others (Beacom & Newman, 2010). Low SEP key informants in an Australian study mentioned their difficulty in understanding health information from their doctor, and often felt too intimidated to ask questions (Dart, Gallois, & Yellowlees, 2008), thus the patients had access to the doctor but not access to the health information.

The place of 'Lay health-knowledge' in understanding health information

Lack of access to health professionals or to health information can limit individuals to word-of-mouth or lay knowledge from lay and interpersonal sources, such as family, friends, and social networks (Kontos et al., 2011). In turn, reliance on these sources may exacerbate knowledge and health gaps as the level of such knowledge is limited to the personal experience of the resource persons (Kontos et al., 2011).

One Brisbane study (Dart et al., 2008) found that persons of lower SEP ranked family and friends third after their local doctor and television, to be the resource from which they obtained most health information. Little is known, however, about the type and quality of lay knowledge and by whom it is provided (Springett, Owens, & Callaghan, 2007). Despite this lack of information, Springett et al., (2007) posit that the failure to incorporate this lay knowledge into the development of lifestyle related messages has led to the differential impact of health promotion that is detrimental to disadvantaged groups. Lay knowledge places the person's health or illness experience within the social context of their everyday lives, where they come from and where they sit in society (Popay, Williams, Thomas, & Gatrell, 1998; Springett et al., 2007).

2.3.3 THE INFLUENCE OF TECHNOLOGY ON HEALTH INFORMATION

Hierarchical medical, educational and media systems are full of technology and complex language that subjugates consumers to the extent that they do not have the knowledge to ask the questions or understand the answers (Bergsma, 2004). The frequent use of technical language is thought to create a particular problem for those seeking health information and is also thought to contribute to the knowledge gap (Niederdeppe, 2008c). Both the technology and the language can become barriers that hinder effective health information seeking (Zeng & Tse, 2006).

Health information on the World Wide Web can be considered an asset, delivered in privacy and without persons having to go outside of their home (Borzekowski & Rickert, 2001). Paradoxically however, whilst technology facilitates a convenient access to overwhelming amounts of health information for some (Ybarra & Suman 2006), such as older age groups (Berry, Spence, Plotnikoff, Bauman, McCargar, Witcher, et al., 2009; Cotten & Gupta, 2004), such access to online information can be impaired by low education and low income levels (Cotten & Gupta, 2004), limiting knowledge about the technology and ability to purchase and learn.

Those going online to seek health information tend to be younger (Bessell, Silagy, Anderson, Hiller, & Sansom, 2002; Cotten & Gupta, 2004), and in the study by Ybarra and Suman (2006) had an average age of 46 years, but online information does not suit all. Twelve percent of older persons aged 60-97 years found the online health related information “too hard to understand” compared to 6.4% of 40-59 year olds and 7.7% of 20-39 year olds (Ybarra & Suman, 2008).

2.3.4 HEALTH LITERACY, UNDERSTANDING HEALTH INFORMATION, AND SOCIOECONOMIC POSITION

Health literacy is about adequately addressing health issues and includes the ability to understand and use information in ways that promote and maintain health with regards to drugs and alcohol, disease treatment and prevention, safety and accident prevention, first aid care, emergencies and staying healthy (ABS, 2009a). Also implied is the

> “... confidence to take action to improve personal and community health by changing personal lifestyles and living conditions. Thus health literacy means more than being able to read pamphlets and make appointments. By improving people’s access to information, and their capacity to use it effectively, health literacy is critical to empowerment” (Nutbeam, 1998, p 357).

Failure to understand health information and advice, termed as inadequate or poor health literacy, has far-reaching implications for individuals as an independent risk factor in itself (Nutbeam, 2008; Volandes & Paasche-Orlow, 2007). Health literacy has been implicated in cases of under-informing patients about their illness and treatment options in situations of ‘informed consent’ (Houts, Witmer, Egeth, Loscalzo, & Zabora, 2001). In other cases, poor health literacy has been deemed responsible in patients’ non-adherence to treatment resulting in poor chronic disease health outcomes (DeWalt, Berkman, Sheridan, Lohr, & Pignone, 2004), and also for limited knowledge about one’s chronic disease (Gazmararian, Williams, Peel, & Baker, 2003; Villaire & Mayer, 2007; Williams, Baker, Parker, & Nurss, 1998). Low functional health literacy may be a remediable factor contributing to inequalities in chronic disease care outcomes (Schillinger, 2001).

Low health literacy affects all population groups (Tooth, Clark, & McKenna, 2000) but is strongly associated with ethnic minority groups, older age, rural living, less education (Paasche-Orlow, Parker, Gazmararian, Nielsen-Bohlman, & Rudd, 2005), and lower socioeconomic status (Paasche-Orlow et al., 2005; Sudore, Mehta, Simonsick, Harris, Newman, Satterfield, 2006). More research is needed to examine relationships between health literacy and the health and social contexts in which individuals live (Ishikawa & Yano, 2008). In Australia, 60% of the population score below a health literacy level considered optimal for health maintenance (United Nations Economic and Social Council, 2009), and in the United States, the majority of those with low health literacy skills are white, native-born Americans (Wickline & Rosenthal, 2010).

Screening tools for measuring health literacy are many and varied (Paasche-Orlow & Wolf, 2007) and outcomes may differ with the measurement tool used (Barber, Staples, Osborne, Clerehan, Elder, & Buchbinder, 2009). As well as these inconsistencies, there is the potential of embarrassment and stigmatisation for the patient (Paasche-Orlow & Wolf, 2007). If people are unable to understand important information, they are not able to make informed decisions and in the context of health this is associated with powerlessness (Fischhoff, Bostrom, & Quadrel, 1993) and injustice (Volandes & Paasche-Orlow, 2007). Measurement of patients' understanding of what the doctor tells them bears some resemblance to victim blaming (Jamrozik, 2010), but a person's health literacy can depend on the condition they are being treated for, the health care provider and the system in which the care is delivered (Baker, 2006), all influencing the quality and delivery of information.

One method of addressing health literacy problems has been to try to improve the communication skills of health professionals. The prevailing bio-medical model of health care has cultivated a system in which doctors struggle to talk and explain health related matters in any other way than that which works best for those who 'think talk and act like physicians' (Volandes & Paasche-Orlow, 2007). As a consequence, health systems assume a high level of health literacy, and whilst the onus is on patients to ask for more information, their understanding is rarely ascertained by the physician (Volandes & Paasche-Orlow, 2007).

Education is directly associated with health literacy and health: education provides knowledge and skills that enable healthy lifestyle choices and access to health care (AIHW, 2008). As well, education influences type of employment, level of income, and thus overall socioeconomic position (ABS, 2009a). Lower education levels are often associated with poor implementation of preventative health behaviours. For example, studies have found women with low education to have limited uptake of folic acid supplementation prior to conception (Eichholzer, Tönz, & Zimmermann 2006), poor implementation of health promoting behaviours such as physical activity (Giles-Corti & Donovan, 2002), and are less likely to purchase foods high in fibre and low in fat, salt and sugar (Turrell & Kavanagh, 2006). Education (Beacom & Newman, 2010) and health literacy (Jensen, King, Davis, & Guntzviller, 2010; Birru, Monaco, Charles, Drew, Njie, Bierria, 2004) are also shown to influence the pursuit of information about health.

2.3.5 HEALTH INFORMATION SEEKING

Health information can help people to understand illness, decide between treatments and gain a general idea about possible outcomes of conditions. As well, it can assist people to understand risk factors and assist them to live healthy lives and prevent disease (Brashers, Goldsmith, & Hsieh, 2002). The acquisition of health information can be seen to lie on an information avoidance – information seeking continuum (Beacom & Newman, 2010; Lambert & Loiselle, 2007). This continuum ranges from unplanned incidental acquisition in which the stimulus for the information has come from outside one's consciousness, to active information seeking strategies such as observing and asking questions (Berger, 2002), or the purposive deliberate seeking of information in an area of importance at the time (Ramanadhan & Viswanath, 2006). Socioeconomic status influences a person's perception of what is important to them but all persons can be reached with health information if the information is communicated and perceived as relevant and motivating (Yows, Salmon, Hawkins, & Love, 1991).

Health information seeking is strongly associated with SEP, and non-seeking behaviours are associated with disadvantage (Beacom & Newman, 2010;

Ramanadhan & Viswanath, 2006). Niederdeppe (2008c) illustrated this relationship by examining socioeconomic differences in health information seeking response to news about celebrities who had contracted cancer. Results indicated that compared to persons with less education, those with a university degree, higher health knowledge, and who engaged in greater community involvement, were more likely to seek health information. This finding supports the idea that knowledge creates knowledge, and because less educated people have a relative dearth of knowledge (and thus less knowledge to build on), may contribute to widening socioeconomic gaps in behaviours that can prevent or detect cancer early (Niederdeppe, 2008c).

2.3.5.1 HEALTH INFORMATION SEEKERS

Different forms of health information delivery appeal or suit different population sectors to varying degrees. Beaudoin and Hong (2011) demonstrated socioeconomic differences in the mediums by which individuals seek health information. Seven hundred American adults were surveyed by phone to determine relationships between mediums for health information seeking (internet, newspaper, and TV), lifestyle behaviours and demographics. Newspapers and TV were used by older persons, the higher educated, and non-whites. Television was used predominantly as a health information source by non-whites. Younger persons, those with highest income, and the most highly educated sought health information via the internet. (Beaudoin & Hong, 2011). Concurring with these results, other studies have found that internet information seekers have higher education levels (Anderson, 2004; Cotten & Gupta, 2004; Weaver, Mays, Lindner, Eroglu, Fridinger, & Bernhardt, 2009; Ybarra & Suman, 2006), higher family income (Bessell, 2002; Ybarra & Suman, 2006), white collar occupations (Weaver, 2009) and are more likely to be female (Anderson, 2004; Bessell, 2002; Ybarra & Suman, 2006). There are, however, those who do not actively seek any further information than that given to them by their doctor. In the literature, these individuals are often referred to as health information ‘non-seekers’.

2.3.5.2 HEALTH INFORMATION NON-SEEKERS

In order to profile health information non-seekers Ramanadhan and Viswanath (2006) used data from the US 2003 Health Information National Trends Survey to study persons whose doctor had told them that they had cancer. The profiles illustrated a strong socioeconomic gradient in both income and education levels, with non-seeker patients having lower income and education levels than those of the health information seeker patients. Non-seeker patients also scored lower on attention to, and trust in, mass media health information and also scored lower on preventative health behaviours. These results concurred with those of another US study (Czaja, Manfredi, & Price, 2003).

Interestingly, even though the low SEP picture of health-information non-seekers is very clear, US Government figures indicate that those who are least likely to use the internet (i.e., older people, low income people and those with fewer years of education), have become some of the quickest to take up internet technology (U.S. Department of Commerce, 2002). Whilst being mindful that lower income groups started with a lower usage rate and therefore have more scope for growth, internet use has in fact grown faster in lower income groups (at an annual rate of 25 percent between December 1998 and September 2001) than it has in higher income groups (at an annual rate of 11 percent in the same period) (U.S. Department of Commerce, 2002), perhaps suggesting a small reduction in the internet skills inequalities gap.

Lack of opportunity has also been shown to be a factor in health information seeking inequality. In a convenience sample of 306 African Americans, it was found that the majority of older and lesser educated diabetics lacked Internet and library access skills and thus opportunity to seek health information on the internet (Carlson, Neal, Magwood, Jenkins, King, & Hossler, 2006). They found that participants over 60 years of age (n=98) were over twice as likely to want to learn to use the Internet and over four times as likely to want to learn to use the library to seek health information than younger participants (Carlson et al., 2006).

One source of health information that has the potential to reach all sectors of the community is mass media (Noar, 2006). Evaluations of mass media campaigns, however, are said to lack consistency in content and format (Bauman et al., 2006), and guidelines for evaluation do not specifically include a socioeconomic perspective. Thus, the extent to which mass media health promotion messages reach all socioeconomic groups in a population is not well established. The following section describes an inquiry designed to explore this question.

2.4 A REVIEW OF MASS MEDIA CAMPAIGN EVALUATION LITERATURE BETWEEN 1992 – 2012: REPORTING OF REACH, UNDERSTANDING AND EFFECTIVENESS BY SEP

2.4.1 BACKGROUND TO THE REVIEW

In order to establish the extent to which response to mass media differs by socioeconomic position, a purposive review was undertaken of evaluations of mass media campaigns published over the last two decades. A framework was developed to guide the presentation of identified material that included any mention of socioeconomic position in mass media campaign development, conduct or evaluation. Such information was presented in terms of participant reach, understanding, and effectiveness (RUE) and included direction of the outcomes from the perspective of lower socioeconomic groups.

Included in the review were evaluations and reports of campaigns in which the message content addressed prevention of lifestyle related chronic diseases (Type 2 diabetes, cardiovascular disease and some cancers) and as such, messages regarding prevention of risk factors for these diseases (weight gain and obesity, low levels of physical activity, and low fruit and vegetable consumption). The review does not concern campaigns regarding the conceptually different entities of tobacco use or alcohol consumption.

2.4.2 SEARCH STRATEGY AND INCLUSION CRITERIA

A broad range of bibliographic databases were searched for the time period 1991 – 2012. These included EBSCOhost (Academic Search Elite, Australia and New Zealand Reference Centre, CINAHL, Medline, PsychINFO, Social Work Abstracts); ScienceDirect, Cochrane Database of Systematic Reviews, PubMed, and Google Scholar. Search Terms included ‘mass media’, ‘media’, ‘health promotion campaigns’, ’campaign evaluation’, combined with ‘chronic disease’, ‘obesity’, ‘physical inactivity’, ‘fruit and vegetable consumption’, and parts there-of. As is often the case, a large number of papers are found using the references of other papers. I used terms such as ‘exercise’ and ‘diet’ in my ongoing searching. Reference lists and the text of articles were scrutinised for campaigns that were not found via database searching. This technique yielded much of the ‘grey literature’ contained in the review. The principal criterion for inclusion of each article was that the campaign utilised ‘mass media’ to deliver the health message, and that the health message concerned prevention of risk factors for lifestyle related chronic disease such as weight-gain, obesity, physical inactivity, and fruit and vegetable consumption. Some of the Australian reports (Bauman, 1999; Carter et al., 2007; Woolcott, 2007a, Woolcott, 2007b, GfK bluemoon, 2009a; The Social Research Centre for the Australian Government Department of Health and Ageing, 2010) are ‘grey literature’ retrieved from the website of the relevant organisation.

2.4.3 REVIEW FINDINGS

The review is discussed in terms of campaigns that were evaluated rather than articles or studies that evaluated campaigns. This approach is required because there is often more than one article reporting on different aspects of a campaign and all of the information required for the review is not obtainable in either one alone.

Evaluation reports of 34 campaigns met the inclusion criteria. Evaluations of 16 campaigns were excluded because they did not report any outcomes by SEP; Reach was reported by SEP in evaluations of 12 campaigns; evaluations of 4 campaigns reported understanding by SEP; and in 15 campaigns, effectiveness was reported by SEP. This distribution is depicted in Figure 2.4. The campaigns meeting inclusion criteria are presented in Table 2.3, grouped by the country in which the campaign was conducted. Findings for reporting of each component of the model (Reach, Understanding and Effectiveness) by SEP are presented and reported separately in tables depicting the direction of results from the perspective of groups of lower SEP (Tables 2.4, 2.5, & 2.6).

Figure 2.4 Distribution of studies considered in the mass media campaign evaluation study review: Reporting of Reach, Understanding, and Effectiveness in socioeconomic terms

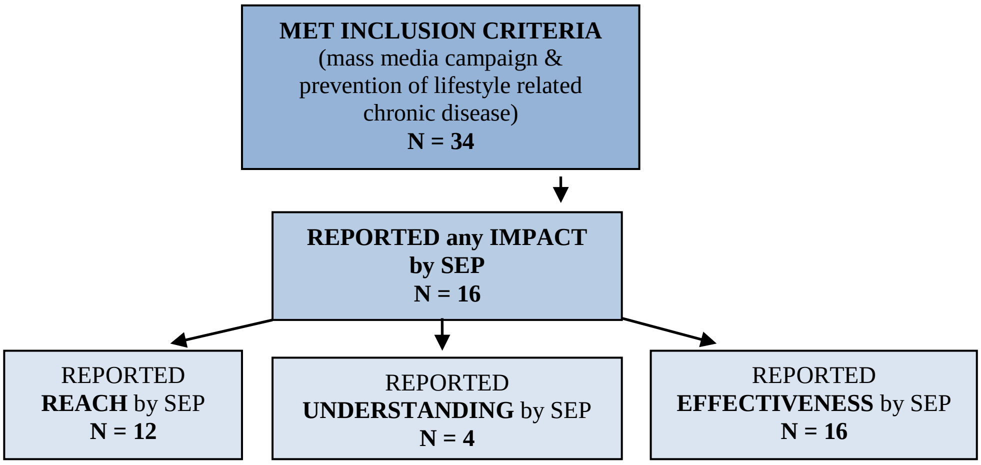


Table 2.3 Evaluations and reports of mass media campaigns 1992–2012 addressing physical activity, nutrition and overweight: Reporting of Reach, Understanding and Effectiveness by socioeconomic position

Author / Campaign / Tagline	Theory / Model / Framework		Reporting / Direction of Outcomes: RUE[1] by Socioeconomic Position
AUSTRALIA & NEW ZEALAND			
Booth *et al*. (1992) "Heart Week 1990" *"Exercise: make it part of your day"*	Social Learning Theory. Social Marketing Theory.	R U E	Recall reported by education attainment. Did not differ by SEP Understanding not reported Effect - Significant increase in walking in least educated group
Owen *et al*. (1995) "Heart Week 1991" *"Exercise: take another step"*	Social Learning Theory. Social Marketing Theory.	R U E	Recall reported by educational attainment. Did not differ by SEP Understanding not reported Effect – low education & tertiary education report a non-significant reduction in walking over previous 2 weeks.
Dixon *et al*. (1998) "2 Fruit 'n' 5 Veg Every Day" campaign	None reported	R U E	Recall more likely in least educated, blue collar, women and young. Understanding not reported Effect – Over 50s/lower educated report higher vegetable consumption, BUT men/ younger age /lower educated report less vegetable consumption

Author / Campaign / Tagline	Theory / Model / Framework		Reporting / Direction of Outcomes: RUE[1] by Socioeconomic Position *(continued)*
Bauman *et al.* (1999) Carnegie *et al.*(2002) "Illawarra Physical Activity Campaign" "*No ifs ... no buts"*	Social ecological theory[2]	R U E	Exposure not reported by SEP Understanding not reported Effect - Similar change in outcome by education.
Bauman *et al.* (2001) "Active Australia" initiative *"Exercise, you have to take it regularly not seriously"*	None reported	R U E	Exposure not reported by SEP Understanding not reported Effect – no difference between socioeconomic groups by educational attainment
Brown *et al.* (2006) "10,000 steps Rockhampton"	Social-ecological framework[2]	R U E	Exposure not reported by SEP Understanding not reported Effect – less in lower SE groups by education BUT those of lower employment status more active
Woolcott Research (2007a) National "*Get Moving*" Campaign	None reported in evaluation document	R U E	Exposure not reported by SEP Understanding not reported Effect – minimal reporting of sedentariness in previous week. All education levels increased sedentariness
Woolcott Research (2007b) National "*Go for 2 & 5*" Campaign	None reported in evaluation document	R U E	Exposure not reported by SEP Understanding not reported Effect -blue collar households less likely to consume 2 or more serves of fruit per day.
Carter *et al.* (2007) "*Don't Ignore Diabetes*"	None reported	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
Pollard *et al.* (2007) Western Australian "*Go for 2 n 5* Campaign"	References: Fishbein & Ajzen, Flay & Cook, & Egger. No theory named.	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
John-Leader *et al.* (2008) "*To be young at heart– Stay Active Stay Independent*"	None reported	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
Morley *et al.* (2009) "*Piece of String*" Campaign	Health Belief Model Social Cognitive Theory	R U E	Exposure reported by education level, work status, household income, and IRSAD[2]. Higher in the less educated BUT lower in low IRSAD groups Understanding not reported by SEP Effectiveness not reported by SEP
Bluemoon Research & Planning Pty Ltd, (2007) ABHI *Measure Up* - Formative Research Report.	The Transtheoretical Model The Health Belief Model Social Marketing	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP

Author / Campaign / Tagline	Theory / Model / Framework		Reporting / Direction of Outcomes: RUE[1] by Socioeconomic Position *(continued)*
O'Hara *et al.* (2011) "*NSW Get Healthy Information and Coaching Service*"	None reported	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
Bauman *et al*. (2003) "*Push Play*" campaign	Social Marketing Theory	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
Leavy *et al.* (2012) *"Find Thirty. It's Not a Big Exercise"* campaign	Social Cognitive Theory	R U E	Awareness higher in Low SEP than high SEP by area & income, but lowest change by education. Understanding (included in 'Intention') Low SEP higher change from baseline than high SEP (but not as high as mid. SEP) by area. Low SEP had largest change by education & income. Low SEP had largest change in Total Physical Activity but didn't maintain it to X-sectional sample 3 whereas Mid and High education groups did.
CANADA AND NORTH AND SOUTH AMERICA			
Poscente *et al.* (2002) *"Small Steps"*	The Transtheoretical Model	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
Craig et al. (2006) *"Canada on the Move"*	None reported	R U E	Lower income least likely to recall campaign or be aware of pedometer Understanding not reported Pedometer ownership significantly less likely with lower education and lower income
Carleton *et al*. (1995) *"The Pawtucket Heart Health Program"*	Social Learning Theory Communication - Behaviour Change Model	R U E	Awareness not reported by SEP Understanding not reported by SEP Reduction in risk factor prevalence greatest for least educated.
Nafziger *et al*. (2001) *"The Otsego-Schoharie Healthy Heart Program"*	None reported	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
Reger *et al*. (2002) *"Wheeling Walks"*	Social ecological[2]	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
Renger *et al*. (2002) *"Yuma on the Move"*	The Transtheoretical Model	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP

Author / Campaign / Tagline	Theory / Model / Framework		Reporting / Direction of Outcomes: RUE[1] by Socioeconomic Position *(continued)*
Huhman *et al*. (2004, 2005) *The "VERB" campaign*	Heirarchy of Effects Model The Verb Campaign Logic Model (includes Branding Theory, Elaboration Likelihood Model, Theory of Planned Behaviour, & Social Cognitive Theory)	R U E	Lower income groups & children with least educated parents more likely to recall Understanding higher in low SE groups by education and income/occupation Effect reported as increase in free-time leisure activity increased for children who lived in urban high density areas & whose parents had less than high school education
Wray *et al.* (2005) *"Walk Missouri"*	Health Belief Model	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
Reger-Nash *et al*. (2006) *"BC Walks"*	Social Marketing Theory	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
Beaudoin *et al*. (2007) *"Steps to a Healthier New Orleans"*	None reported	R U E	Recall not clearly defined by SEP (levels not defined) Understanding not reported by SEP Outcomes not clearly defined by SEP
Buchthal et al. (2011) *"Start. Living. Healthy"*	None reported	R U E	Lowest education & lowest level of poverty less likely to recall campaign Understanding not reported by SEP Effectiveness not reported by SEP
Matsudo *et al.* (2006) & Matsudo *et al.* (2002a) (Eng. abstract only) *"Agita São Paulo"*	Social Ecological Model[2]	R U E	Higher recall in public school (poorer) students Understanding not reported by SEP Effectiveness reported for richest and poorest groups. Poorest groups least likely to reach activity recommendations
EUROPE			
Stamm et al. (2001) *"Allez Hop!"*	The Transtheoretical Model.	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
Wammes *et al.* (2007) *"Maak je niet dik" ("Don't get fat")*	Health Belief Model Protection Motivation Theory.	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP
Van Acker *et al.* (2011) *"10,000 Steps"*	Roger's Diffusion of Innovations Theory. RE-AIM for impact[2]	R U E	Exposure not reported by SEP Understanding not reported by SEP Effectiveness not reported by SEP

Author / Campaign / Tagline	Theory / Model / Framework		Reporting / Direction of Outcomes: RUE[1] by Socioeconomic Position *(continued)*
UNITED KINGDOM			
Wimbush et al (1998) *"Walking: Take exercise in your stride"*	None reported	R U E	Reach 'somewhat' higher in lowest SEP groups (mentioned by SEP in text no data given) Understanding not reported by SEP Effectiveness - take-up of the direct response option (Fit line) was least in lower SE groups by social class & housing tenure.
Hillsdon *et al*. (2001) *"Active for Life"*	Social Marketing Theory	R U E	Awareness higher in the lowest social grades Understanding - change in knowledge - minimal difference between social grades Effectiveness - Numbers meeting guidelines for mod/vigorous physical activity decreased similarly for both social grades
Wardle *et al*. (2001) Miles et al. (2001) The BBC's *"Fighting Fat, Fighting Fit"* campaign	Social Learning Theory Health Belief Model	R U E	Awareness - least educated and lower social class less likely to recall campaign Understanding - least educated and lower social class less likely to remember message Effectiveness (mixed) - lower SEP had higher fruit and veg intake BUT higher weight gain, snack consumption and lack of exercise.

Campaign reported in socioeconomic terms.
[1] R = Reach, U = Understanding, E = Effectiveness.
[2] Based on Social Ecologic Model or aligned with Social Ecological theory.

2.4.3.1 REPORTS OF 'REACH' IN SOCIOECONOMIC TERMS

Reach is reported variously as awareness, recall, reach, and exposure. Systematic reviews examined for the literature review (Brown et al., 2012; Cavill & Bauman, 2004; Heath et al., 2012; Kahn et al., 2002; Leavy et al., 2012; Marcus et al., 1998) included very few articles (Booth et al., 1992; Owen et al., 1995; Wimbush et al., 1998) that reported campaign reach by SEP. Of the 18 mass media campaign evaluations that reported any socioeconomic impact, only 12 reported reach in socioeconomic terms. Table 2.4 depicts details of these studies including the direction of outcomes by SEP and the socioeconomic indicator used to determine SEP. Outcomes were mixed showing that lower SEP group awareness, recall, or exposure did not differ (Booth et al., 1992 and Owen et al., 1995); was higher (Hillsdon et al., 2001; Matsudo et al., 2006; Wimbush et al., 1998), more likely (Dixon et al., 1998; Huhman et al., 2005), differed by socioeconomic indicator in the same study (Craig et al., 2006; Leavy et al., 2012; Morley et al., 2009); or was less likely (Buckthal et al., 2011; Wardle et al., 2001), than in middle or higher SEP groups. In summary, there was no difference by SEP in two studies; in each of three studies, there was mixed awareness between socioeconomic indicators; lower SEP groups were more likely to be aware in five studies, and lower SEP groups were less likely to be aware in two studies. There is a small tendency for higher campaign awareness in lower socioeconomic groups but no clear outcome.

Table 2.4 Mass media campaigns 1992-2012: reports of Reach by SEP

Author / Year / Campaign	Awareness by SEP indicator	Direction of reach outcome in terms of lower socioeconomic groups
AUSTRALIA & NEW ZEALAND		
Booth *et al.* (1992) *Heart Week 1990*	Recall by educational attainment	Did not differ by SEP
Owen *et al*. (1995) *Heart Week 1991*	Recall by education	Did not differ by SEP
Dixon *et al.* (1998) *2 Fruit 'n' 5 Veg Every Day*	Awareness by education, skill level, white or blue collar occupation	Awareness more likely in least educated, blue collar occupations, women and younger respondents
Morley *et al.* (2009) *Piece of String*	Exposure by education level, work status, household income, IRSAD[1]	Mixed results: Highest in the least educated and in those not working, BUT lowest in lower IRSAD groups and lowest in middle income group
Leavy *et al.* (2012) *Find Thirty. It's Not a Big Exercise*	Awareness by SEIFA[2] area code, education level, and income.	Awareness higher in Low SEP than high SEP by area & income, but lowest change by education.
CANADA AND NORTH & SOUTH AMERICA		
Craig et al. (2006) *Canada on the Move*	Campaign recall & pedometer awareness reported by education and income	Mixed results: Recall did not differ by education BUT lowest income group least likely to hear of campaign. Least educated & lowest income least aware of pedometers
Huhman *et al*. (2005) *The VERB campaign*	Recall by income and parent's education level	Lower income & children with least educated parents more likely to recall
Buchthal et al. (2011) *Start. Living. Healthy.*	Recall of campaign by education and income levels	Least educated and lowest level of poverty less likely to recall campaign or remember message
Matsudo et al. (2006) *Agita São Paulo*	Recall of program brand and purpose: public / private school	Higher recall in public school (poorer) students
UNITED KINGDOM		
Wimbush et al (1998) *Walking: Take exercise in your stride*	Awareness by manual / non-manual worker reported briefly in text (no data)	Awareness 'somewhat' higher in C2DE (lowest) social class groups. No data reported
Hillsdon *et al*. (2001) *Active for Life*	Awareness by Social Grade	Awareness higher in the lowest social grades
Wardle *et al.* (2000) *Fighting Fat, Fighting Fit*	Awareness and memory of message by education level and social class	Least educated and lower social class less likely to recall campaign or remember message

[1] Index of Relative Socioeconomic Advantage and Disadvantage
[2] SocioEconomic Index for Areas

2.4.3.2 REPORTS OF ‘UNDERSTANDING’ IN SOCIOECONOMIC TERMS

Campaign evaluations were scrutinised for reports of participants’ understanding, comprehension, perception, or knowledge about the meaning of the campaign message. Of the 18 studies that reported socioeconomic impact only 4 reported any of these factors in socioeconomic terms (see Table 2.5). As shown in Table 2.5 for the West Australian *“Find Thirty, It’s not a Big Exercise”* campaign (Leavy, 2012), understanding was measured as part of the ‘Intention’ outcome. The greatest changes in intention were predominantly in low SEP groups. The VERB campaign in the United States of America, aimed at increasing physical activity in children, had similar results. The number of free-time physical activity sessions per week was significantly higher post-campaign in low income and low education respondents who recalled and understood the campaign message compared to those who recalled but did not understand the campaign message (Huhman et al., 2005). The BBC’s *“Fighting Fat, Fighting Fit”* campaign targeted those who had a higher tendency towards obesity. In this campaign the least educated and lower social class were less likely to remember the campaign message (Wardle, 2001; Miles, 2001). England’s *“Active for Life”* campaign that targeted women 16-24 years and over 50 years , and men 45-55 years (Hillsdon, 2001), reported minimal differences between socioeconomic groups in change in knowledge about physical activity recommendations. The two studies, the VERB campaign (Huhman et al., 2005) and “*Find Thirty. It’s Not a Big Exercise*” (Leavy et al., 2012) that most definitively measured understanding, showed increases in this outcome to be higher in lower socioeconomic groups. In summary, socioeconomic differences in respondents’ understanding of mass media campaign messages is very much under evaluated, and there is no clear direction in outcomes or consistency in the evaluation methods used.

Table 2.5 Mass media campaigns 1992-2012: reports of Understanding by SEP

Author/ Year/ Campaign / Tagline	Direction of understanding outcome in terms of lower socioeconomic groups
AUSTRALIA	
Leavy *et al.* (2012) *Find Thirty. It's Not a Big Exercise*	Understanding included in 'Intention' and not reported as 'understanding'. Low SEP higher change from baseline than high SEP (but not as high as middle SEP) by area. Low SEP had highest change by education & income.
CANADA AND NORTH & SOUTH AMERICA	
Huhman *et al*. (2005) *The VERB campaign*	Understanding was measured by 2 open ended questions. 1. "Please tell me in your own words what VERB is all about", plus standardised probing questions; Can you tell me more? What does that mean? Anything else? 2. "What ideas did VERB give you?" plus standardised probing questions as above. Understanding was higher in low SE groups determined by education and income/occupation.
UNITED KINGDOM	
Wardle *et al*. (2001) BBC's *"Fighting Fat, Fighting Fit"* campaign	Understanding determined by open ended question "Could you say what the campaign was about?" Responses coded by the interviewer into: obesity, dieting, healthy eating, being more active, eating disorders, other, & don't know. Referred to as 'understanding' in the test.
Miles et al. (2001) BBC's *"Fighting Fat, Fighting Fit"* campaign.	Least educated and lower social class were less likely to remember message.
Hillsdon et al. (2001) England's "ACTIVE for LIFE" campaign.	Knowledge analysed by gender, age, awareness & social grade. Minimal difference between social grades in change in knowledge about recommendations for physical activity.

2.4.3.3 REPORTS OF 'EFFECTIVENESS' IN SOCIOECONOMIC TERMS

Of the 18 campaign evaluations that reported any socioeconomic impact, 16 reported campaign effectiveness in socioeconomic terms. Table 2.6 depicts these studies including the socioeconomic indicator and direction of outcomes by SEP. In 4 studies the campaign was more effective for participants of lower SEP (Booth, 1992; Carleton et al., 1995; Leavy, 2012; Huhman, 2005). In 4 studies it was less effective for participants of lower SEP (Wimbush, 1998; Craig, 2006; Matsudo, 2006; Woolcott Research, 2007b). Mixed results within socioeconomic levels were reported in 4 studies (Owen, 1995; Dixon, 1998; Wardle, 2001; Brown, 2006), and in 3 studies there was no difference by SEP (Bauman, 1999; Bauman, 2001; Hillsdon, 2001). In one study sedentariness increased in both high and low adult education levels from baseline (Woolcott Research, 2007a). Such results have no clear direction and are inconclusive.

Table 2.6 Mass media campaigns 1992-2012: reports of Effectiveness by SEP

Author/ Year/ Campaign / Tagline	Direction of Effectiveness outcome in terms of lower socioeconomic groups
AUSTRALIA & NEW ZEALAND	
Booth *et al.* (1992) "Heart Week 1990" *"Exercise: make it part of your day"*	Significant increase in walking in least educated group compared to those with high school or tertiary education, 2-4wks after the campaign
Owen *et al*. (1995) "Heart Week 1991" *"Exercise: take another step"*	Low education and tertiary education groups report a non-significant reduction in walking over the previous 2 weeks, 3-4 weeks after the campaign
Dixon *et al.* (1998) *"2 Fruit 'n' 5 Veg Every Day"* campaign	Overall, men/ younger age /lower educated groups report less vegetable consumption BUT for the over 50s, lower educated groups report higher vegetable consumption,
Bauman *et al.* (1999) "Illawarra Physical Activity Campaign" *"No ifs ... no buts"*	Similar change in physical activity outcomes by educational attainment
Bauman *et al.* (2001) "Active Australia" initiative. *"Exercise, you have to take it regularly not seriously"*	No difference between socioeconomic levels (educational attainment) in likelihood of increasing total activity by at least 1 hour per week
Brown *et al.* (2006) *"10,000 steps Rockhampton"*	Those with less education were less likely to be classed as 'active' than those with university education. BUT those not in full time employment were more active
Woolcott Research (2007a) "*Get Moving*" Campaign	All education levels increased sedentariness in week prior to follow up compared to baseline.
Woolcott Research (2007b) National "*Go for 2 & 5*" Campaign	Parents from blue collar households significantly less likely than those with professional or senior management occupations or white collar households to consume 2 or more serves of fruit per day
Leavy *et al.* (2012) "*Find Thirty. It's Not a Big Exercise"*	Low SEP had the largest (but not significant) change in Total Physical Activity (TPA) from baseline to survey 2 (11 months post baseline survey and immediately after the 3rd media wave. TPA decreased at 3rd survey 20 mths post baseline and after 7th media wave. High education groups had significant increases in TPA at surveys 2 & 3
CANADA AND NORTH AND SOUTH AMERICA	
Carleton *et al*. (1995) "*The Pawtucket Heart Health Program"*	Reduction in risk factor prevalence greatest for least educated.
Huhman *et al*. (2005) *The "VERB" campaign*	The highest number of free-time leisure activity sessions were reported for children (who recalled the campaign and understood the message) living in urban high density areas, family had the lowest income & parents had less than high school education compared to high school graduates and upwards.
Craig et al. (2006) *"Canada on the Move"*	Pedometer ownership significantly less likely with lower education and lower income

Author/ Year/ Campaign / Tagline	Direction of Effectiveness outcome in terms of lower socioeconomic groups *(continued)*
Matsudo *et al.* (2006) *"Agita São Paulo"*	Effectiveness reported for richest and poorest groups. Poorest groups least likely to reach physical activity recommendations.
UNITED KINGDOM	
Wimbush et al (1998) *"Walking: Take exercise in your stride"*	Take-up of the direct response option (Fit line) was least in lower socioeconomic groups by social class & housing tenure.
Hillsdon *et al*. (2001) *"Active for Life"*	Numbers meeting guidelines for moderate /vigorous physical activity decreased similarly for both social grades
Wardle *et al*. (2001) BBC's *"Fighting Fat, Fighting Fit"* campaign	Effectiveness (mixed) – lower socioeconomic groups had higher fruit and veg consumption BUT higher weight gain, snack consumption and lack of exercise.

2.4.4 DISCUSSION OF REVIEW AND FINDINGS

It should be noted that information about reach, understanding, and effectiveness was reported in varying degrees and SEP indicators were measured in various ways. For example in one report, socioeconomic differences in awareness of the campaign message were defined by whether the students attended either a public or a private school (Matsudo, 2006). In another, the evaluation receives only a small mention in the text with no accompanying data (Wimbush, 1998).

With reference to the questions being asked by the review:

Did reach of the campaign message differ by socioeconomic group?

Reach was reported as recall or awareness. The published evidence suggests a small tendency for higher campaign awareness in lower socioeconomic groups but no clear outcome.

Did understanding of the message differ by socioeconomic group?

Reporting of understanding the campaign message was rare, thus also considered under this banner were reports of knowledge, and remembering the campaign tag line or message. Socioeconomic differences in respondents' understanding of mass media campaign messages is very much under evaluated, and there is no consistency in the evaluation methods used.

Did health behaviour change differ by socioeconomic group?

Behaviour change was reported in proximal or distal terms, results were mixed with no direction and were thus inconclusive.

2.4.5 REVIEW SUMMARY AND IMPLICATIONS

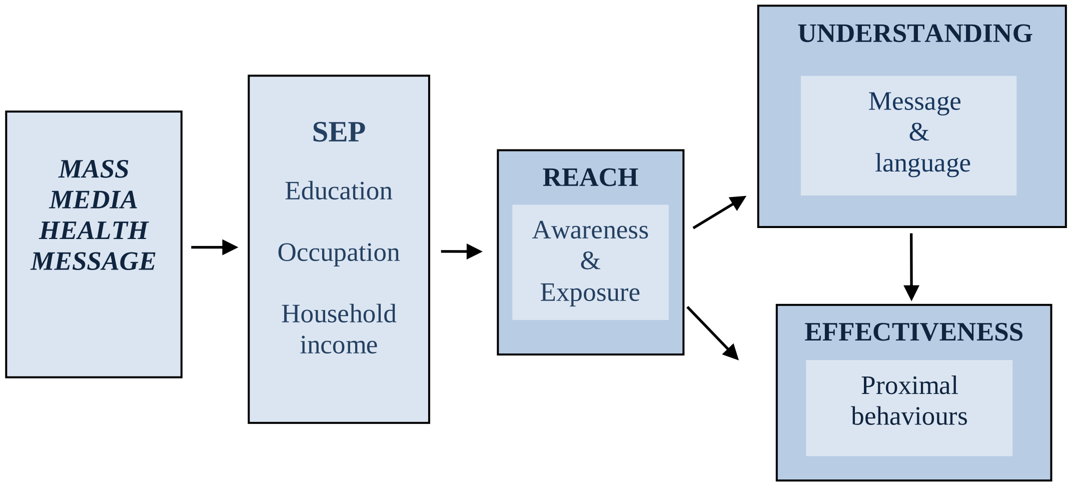
When the reviewed campaigns have been evaluated in socioeconomic terms, results have been limited, non-specific, mixed, and often inconclusive. Thus, there is no evidence of a clear or convincing direction with regards differential response by socioeconomic groups to mass media health promotion campaigns that address lifestyle related chronic disease. The lack of specific work done in this area indicates a need for evidence to determine whether socioeconomic groups do differ in their awareness, understanding and proximal behavioural response to mass media health promotion campaigns and this in turn may contribute valuable information to the debate regarding the role that mass media is suggested to have in increasing health inequality. As well, information regarding the magnitude and nature of SEP differences can be used to review mass media campaign design from philosophical basis to final evaluation of outcomes. The study hypotheses and conceptual model are discussed in the next section.

2.5 STUDY HYPOTHESES AND CONCEPTUAL MODEL

2.5.1 CONCEPTUAL MODEL

The conceptual study model (Figure 2.5) depicts the filtering effect that SEP (measured in terms of education, occupation, and household income) may have on the reach and understanding of the campaign message, and effectiveness of the message in proximal behavioural terms. The hypothesised mediating role of 'understanding' is depicted between mass media reach and effectiveness in proximal behavioural terms.

Figure 2.5 Conceptual Model



2.5.2 HYPOTHESES

Based on the findings of the foregoing literature review, the following null hypotheses are proposed:

H_1 Mass media campaign reach in terms of respondents' campaign awareness will not differ by socioeconomic position.

H_2 Understanding of a mass media campaign message and language will not differ by socioeconomic position.

H_3 Mass media campaign effectiveness in terms of respondents' proximal behavioural responses will not differ by socioeconomic position.

2.6 CHAPTER SUMMARY

This chapter reviewed evidence supporting the need for the evaluation of mass media campaigns from a socioeconomic perspective. It examined types of mass media campaigns and explored their place in health promotion. The integration of theory into campaign development and evaluation was also examined from the perspective of the Social Ecological model that considers individual, social, and neighbourhood determinants of health behaviour. Following this, literature about mass media health promotion campaign evaluation was discussed in terms of theorists, and past methods and outcomes. Three theoretical evaluation models were examined and utilised in the development of the framework for the current thesis. Each dimension of the new study model, reach, understanding, and effectiveness, was discussed in terms of its inclusion as well as past measurement and the problems of methodological rigour. One of these problems, namely that of limited determination of campaign penetration across all population groups, supported the need for more focused research.

Paralleling this limited evidence of campaign penetration are (mostly) anecdotal comments that mass media health promotion campaigns widen health inequality gaps between socioeconomic groups. This idea is examined in terms of the available evidence to back these comments, and also explores where inequalities may pervade mass media health promotion interventions, from planning through delivery to evaluation. From the receiver perspective, factors that affect population response to mass media, such as health literacy, technology and technological language, lay health knowledge, and health information seeking, are also explored.

In the final section of this examination of the literature, I have presented the results of a review conducted for the current research. This review specifically examines from a socioeconomic perspective, the reporting of mass media health promotion campaign evaluation studies conducted over the last two decades. The outcomes of this review were mixed and inconclusive, and indicated the need for a study focussed specifically on determining socioeconomic level differences in response to a mass media health promotion campaign.

For this enquiry, a current national mass media health promotion campaign called *Measure Up* is used as a medium by which to evaluate differential socioeconomic group response to a campaign aimed at prevention of lifestyle-related chronic disease. A conceptual study model is depicted and hypotheses defined. The following chapter describes the methods used to test these hypotheses.

Chapter 3: Research Methods

3.0 INTRODUCTION

This chapter describes the study design and methods used in this thesis research. The chapter is divided into five sections. The first section discusses methods used by other investigators to examine differences in socioeconomic response to mass media health promotion campaigns, and establishes the rationale for the choice of method used for the current study. The second section covers the scope, design, and timing of the research for this thesis as well as development of the survey instrument; the third discusses the pilot study method and results; the fourth discusses conduct of the main survey, the study sample, a description of the measures and their statistical properties, and the analytic plan. The fifth section discusses the test-retest reliability method and results.

3.1 PREVIOUS APPROACHES TO INVESTIGATING SOCIOECONOMIC DIFFERENCES IN RESPONSE TO MASS MEDIA HEALTH PROMOTION CAMPAIGNS

As reported in Chapter 2, the body of literature documenting socioeconomic response to mass media health promotion campaigns concerning healthy lifestyle (physical activity, diet and weight gain prevention), is small. This scarcity of good evidence is almost replicated in the domain of SEP response to anti-smoking mass media campaigns (Niederdeppe et al., 2008a). Together, these studies constitute a body of literature that might be examined to establish the types of mass media campaigns, and advertisements that are most likely to secure more equal response across socioeconomic groups (Guillaumier et al., 2012; Niederdeppe et al., 2008a).

Approaches to the collection of information about campaign response by SEP have varied widely. Preferred methods have included data acquisition through full contact with respondents such as face to face (sometimes referred to as personal, or in-home) interviews (Matsudo et al., 2006; Hillsdon et al., 2001; Miles et al., 2001; Wardle et al., 2001; Carleton et al., 1995; Owen et al., 1995; Booth et al.; 1992), and by voice only contact in telephone interviews (Buchthal et al., 2011; Leavy et al., 2011; Morley et al., 2009; Niederdeppe et al., 2008b; Siahpush, Vallone et al., 2011; Wakefield, Spittal, & Durkin, 2007; Woolcott Research (2007b); Brown et al., 2006; Huhman et al. 2005; Bauman et al., 2001; Owen, L. 2000; Bauman et al., 1999; Dixon et al., 1998; Wimbush et al., 1998). Less frequently used methods are those that have no direct personal contact with respondents such as studies where data are extracted from various registries or databases (Anderson, Mullins, Siahpush, Spittal, & Wakefield, 2009) before and after a campaign, and postal surveys (Miles et al., 2001, Osler & Jespersen, 1993), as presented in Table 3.1.

Table 3.1 summarises the literature published since 1992 that has addressed socioeconomic differences in target population response to mass media health promotion campaigns. The summaries are grouped by the risk factor/s that the campaigns are designed to address, and the table includes campaign details, target group and aim in the left-hand column; study design, data collection methods and measures, specifically socioeconomic measures in the centre column; and on the right depicts the reporting of socioeconomic differences in campaign reach, understanding and effectiveness by SEP. The focus of the table is on the methods used to determine socioeconomic response.

Of the twenty five studies included in Table 3.1, fourteen were conducted by telephone interview, seven by face to face interview, two studies used data extraction methods from a data registry or already collected data, and two used a postal survey.

Table 3.1 Approaches to investigating socioeconomic response to mass media health promotion campaigns since 1992

Study Details	Evaluation Methods and Measures	Reporting of Reach/ Understanding/ Effectiveness by SEP
Cervical screening		
Anderson *et al*. 2009 Promoting Cervical screening. 2004 -2005 Target: women 40-69 y *Don't just sit there* campaign. Australia.	Pre-post design, **data extraction** form Victorian Cervical Cytology Registry. **Measures:** Numbers of Papanicolau (cervical screening) tests/ week for women aged 18-69 in 2005. **SEP Measures:** Socioeconomic distribution by post code categorised by ISEAD[1]. ISEADs ranked from lowest to highest then categorised into quintiles.	**Effectiveness:** Increase in numbers from pre-campaign to post-campaign in each quintile. Campaign was equally effective in encouraging Pap screening across all socioeconomic groups.
Antismoking		
Vallone *et al*. 2011 Smoking cessation in low income & blue collar smokers of diverse race/ ethnicity, aged 25-49, who want to quit. The *EX Campaign.* USA	Longitudinal, pre-post design. **Telephone interviews.** **Baseline:** List assisted random digit dial 5616 eligible respondents Feb-Apr 2008. **Follow up:** Same respondents 6 months after campaign launch 4067 respondents using CATI[2]. **Measures:** - Awareness: confirmed by respondent describing ad. - Cessation-related Cognitions Index: 8 items about how respondents were thinking about quitting. Quit attempts. **SEP Measures:** Education by 4 categories**:**	**Reach:** Confirmed awareness: those with lower education were significantly less aware. **Effectiveness:** Change in: Cessation-related Cognitions Index score. Quit attempts. Increase among smokers with less than a high school education.
Siahpush *et al*. 2007 Targeted and timed to reach lower SES group. Ongoing anti-smoking TV advertising post *Australian National Tobacco Campaign.* Australia.	**Data extraction** to perform Time trend series of *Quitline* responses to an ongoing TV advertising campaign. **Measures:** -Victorian *Quitline* call volume Jan 2001-Mar 2004 obtained from Quit Victoria administration records. Weekly TARPS[4] to determine differential SES response to advertising. **SEP Measures:** Post codes provided by *Quitline* callers were categorised by ISEAD[1] and ranked from lowest to highest. ISEADs were then categorised into quintiles: 1st quintile = low SEP, 5th quintile = high SEP	**Effectiveness:** *Quitline* call rates were similar across SEP quintiles. Responses to increased volume of TARPs did not vary by SEP quintile.
Owen, L. 2000. Ongoing antismoking mass media campaign. National Helpline for Smokers. 1994-1998. UK	**Telephone interviews** for Post-campaign follow-up of *Quitline* callers randomly selected from fully completed questionnaires in *Quitline* log sheets. Telephone recall survey at Baseline (2 months) and follow-up (12 months after initial respondent call). **Measures:** Change in smoking behaviour **SEP Measures:** Social Class: ABC1- Non-Manual C2DE- Manual/ Unemployed	**Effectiveness:** Results were not statistically significant: Fewer C2DE grades stopped smoking. No difference between social grades of those who reduced consumption. More C2DE grades increased consumption.

Study Details	Evaluation Methods and Measures	Reporting of Reach/ Understanding/ Effectiveness by SEP *(continued)*
Niederdeppe *et al.* 2008b Wisconsin Tobacco Prevention and Control Program. US. May 2002 – Dec 2003. *Keep trying to Quit & Second Hand Smoke*	**Telephone interviews** for longitudinal follow-up of response to ongoing TV advertisements. Random digit dialling for baseline survey (51% RR) Follow up by phone with those agreeing to be contacted. Both surveys completed by 452 smokers (29%) enrolment. **Measures:** Prompted ad recall, *Quitline* awareness, beliefs about second hand smoke health effects, & beliefs about tobacco industry practices. Quit attempts in previous year and abstinence at follow up. **SEP Measures:** Highest Educational attainment by 3 categories. Annual household income by 4 categories.	**Reach:** Recall quite variable between SEP groups and appeared ad dependent **Effectiveness:** Results not significant.
Physical activity		
Booth *et al.* 1992 Heart Week 1990: *Exercise: make it part of your day.* Purpose was to provide public education on the role of physical activity.	Pre-post campaign design. National probability **face to face interview** survey samples were obtained by a market research company. **Measures: -** Sociodemographic -Prompted recall of campaign message - Beliefs about physical activity. - Self-reported exercise - Differences in campaign effect physical exercise **SEP Measures:** Highest educational attainment	**Reach:** Recall reported by educational attainment: Did not differ by SEP **Effectiveness:** Change in walking for exercise in the previous 2 weeks and change in sedentary behaviour: Significant increase in walking in least educated group
Owen *et al*. 1995 Heart Week 1991: *Exercise: take another step.*	Pre-post campaign design. Random sampling of households until a pre-set quota was reached. **Face to face interviews** 2 weeks pre-campaign and 3-4 weeks post campaign. **Measures: -** Sociodemographic -Prompted **r**ecall of campaign message - Beliefs about physical activity. - Self-reported exercise - Differences in campaign effect on physical exercise **SEP Measures:** highest educational attainment	**Reach:** Recall reported by educational attainment: Did not differ by SEP. **Effectiveness:** Change in walking frequency & change in sedentariness. Least educated and Tertiary educated report a non-significant reduction in walking over previous 2 weeks.
Bauman *et al*. 1999 Illawarra Physical Activity Campaign" *No ifs ... no buts* Target: inactive adults 40-60 yrs. Aim: to increase awareness and participation in moderate intensity physical activity in the Illawarra. July 95 – Dec 98	Population impact study. **Telephone surveys**, repeat independent random sampling by random digit dialling. **Measures:** Recall of campaign name (shopping centre intercept surveys) - 1997 Population Phone survey: - Understanding of the moderate Physical Activity message - Reported PA participation in previous 2 weeks. - Usual habit of PA over previous 6 months. - Stage of change for PA - Walking for transport, recreation **SEP Measures:** Educational attainment, employment, occupation.	**Effectiveness:** Change in 'sufficient activity', and change in energy expenditure: Similar change in outcomes by education level.

Study Details	Evaluation Methods and Measures	Reporting of Reach/ Understanding/ Effectiveness by SEP *(continued)*
Bauman *et al.* 2001 Active Australia initiative: *Exercise, you have to take it regularly not seriously.* Feb-Mar 1998. NSW	**Telephone interviews** for pre-post campaign design with independent, cross-sectional samples. Random telephone sampling. **Measures:** - Message recall Knowledge about moderate physical activity Physical activity participation and antecedents **SEP Measures:** Educational attainment - 3 categories.	**Effectiveness:** Change in physical activity: no difference between SEP groups by educational attainment.
Brown *et al.* 2006 10,000 steps Rockhampton Jan 2002-Jun 2003.	**Telephone interviews.** Quasi-experimental design. Random sampling from electronic telephone data base. CATI used for baseline and follow up. **Measures:** - Awareness, age, gender, living situation **SEP Measures:** Education level – 5 categories, employment status – 5 categories.	**Effectiveness:** 'Active' versus 'Inactive'. Least 'Active' in lower SEP groups by education but lower employment status more 'Active'.
Craig *et al.* 2006 *Canada on the Move* Aim to promote walking through pedometer use.	Cross sectional, two stage random sampling from a **telephone monthly omnibus**. Baseline, post-launch and post-second wave data. Random digit dialling to select household, then adult > 18 yrs. closest birthday. **Measures**: Gender, age, awareness, prompted recall of campaign taglines differentiated by including taglines from other campaigns. **SEP Measures:** Education & income.	**Reach:** Prompted recall of campaign taglines amongst other campaign taglines, and awareness of pedometers. Lower income least likely to recall campaign or be aware of pedometers. **Effectiveness:** Pedometer ownership significantly less likely with lower education and lower income
Huhman *et al*. 2005; Huhman *et al*. 2007 *The VERB campaign*. Aim to increase physical activity levels among children 9 to 13 years	**Telephone interviews** for a prospective, longitudinal, quasi-experimental design. Random Digit Dialling sampling for Baseline nationally representative CATI survey April 2002. One year follow-up. **Measures:** Demographic: child - age, gender, and race/ethnicity. - Unprompted and prompted awareness – 4 categories of recall and understanding 1) no recall of the campaign, 2) recall but no understanding, 3) aided recall with understanding, and 4) unaided recall with understanding. (Understanding determined by child's response to open ended question "What is VERB all about?" & "What ideas does VERB give you?" - Free-time physical activity, - Organized physical activity **SEP Measures:** Parent's education level, household income: 4 categories. Population density: 5 categories	**Reach:** Lower income groups & children with least educated parents more likely to recall. **Understanding:** Higher in low SEP groups by education and income/occupation **Effectiveness:** Effect reported as increase in free-time leisure activity. Increased for children who lived in urban high density areas & whose parents had less than high school education.

Study Details	Evaluation Methods and Measures	Reporting of Reach/ Understanding/ Effectiveness by SEP *(continued)*
Matsudo *et al.* 2006 Matsudo *et al.* 2002b (English abstract only) *Agita São Paulo*	One or two yearly randomised, stratified, **in-home interviews** with general population and specific groups. Interviews carried out by a population survey agency. Randomisation method not stated. **SEP Measures:** Classes CDE (lower, poorer) AB (higher, richer) & education levels. **Measures:** - Program name & message recall -Level of understanding re. name and message -Physical activity levels _IPAQ questionnaire. Inactive/ Irregularly /Active	**Reach:** Higher recall in public school (poorer) students **Effectiveness**: Reported for richest and poorest groups. Poorest groups least likely to reach activity recommendations.
Wimbush et al. 1998 *Walking: Take exercise in your stride.* Targeted women and men 30-55 years who did not exercise regularly. Campaign promoted calls to *Fitline* for information about getting fit.	Multi-modal evaluation methods and measures. 1. Pre-post-campaign design using 5 questions in System 3 Scotland's monthly **telephone omnibus survey** pre-campaign June 95, and post-campaign June 96 (measured campaign impact on adults' knowledge, beliefs, motivations, intentions and behaviours about exercise and walking. 2. Four-monthly **telephone** Communications Tracking Survey using multi-stage, cluster, random probability sampling methods (measured prompted awareness). 3. Baseline, ten-week, and 1 year follow-up **telephone interview** surveys of a random sample of *Fitline* callers who consented to follow up. Measured change in walking, physical activity and 'stage of change' in active responders to *Fitline*. **SEP Measures:** Social grade AB, C1, C2, DE, and Housing tenure (only from *Fitline* respondents)	**Reach:** Awareness: Greater in lower SEP by Social grade. **Effectiveness:** Measured in *Fitline* callers only: Least effective in manual workers & those who did not own their own home.
Hillsdon *et al.* 2001 *Active for Life* Targeted at separate phases: young women 16–24 y; mid-aged men 45–55 y; men and women over 50 y. Media strategy emphasised people from lower social grades.	A multi-stage cluster, random probability design to identify a sample of addresses. A representative sample of adults ≥16yrs. were selected using the small users Postcode Address File (PAF) for England. **In-home, 30 minute survey.** Cohort design with baseline and 1 yr. follow up. Sample selection & fieldwork conducted by a market research company. **Measures: -** Awareness unprompted and prompted. Physical activity (PA), physical health. Knowledge of current physical activity guidelines Perceived benefits and barriers, and readiness to increase physical activity. **SEP Measures:** Social Grade AB, C1, C2, DE, and Home ownership.	**Reach:** Awareness: Greater proportions of respondents from lower social grades were aware. Higher proportions of respondents in rented accommodation aware but not significant. **Understanding:** Knowledge of recommended PA guidelines less in lower social grade. **Effectiveness:** No campaign effect and no difference by social grade

Study Details	Evaluation Methods and Measures	Reporting of Reach/ Understanding/ Effectiveness by SEP *(continued)*
Diet		
Dixon *et al.* 1998 *2 Fruit 'n' 5 Veg Every Day* campaign. Aim was to increase awareness of need to consume more fruit and vegetables and increase individual consumption of same in Victoria.	Four annual post-campaign **telephone surveys** each of 500 Victorians 20 years or older. **Measures:** - Awareness by prompted recall of slogan, campaign, and advertisements. - Beliefs about fruit and vegetable consumption. - Actual consumption of fruit and vegetables. **SEP Measures:** Education – 3 categories, and Occupational status of the main income earner of household (Highly skilled/Less skilled, Blue/ White collar)	**Reach:** Recall by education, occupation, & skill level. Least educated and Blue collar more likely to be aware of campaign. **Effectiveness:** Least educated report lower levels of fruit and vegetable (F&V) consumption, and believed that they should eat less F&V. Blue collar believed they should eat less vegetables
Woolcott Research 2007b National *Go for 2 & 5* campaign	Pre-post design with 2 time point follow up. Baseline **telephone surveys** conducted March-April 2005. The sampling frame for each survey was the latest version of the electronic White Pages on CD-ROM. A stratified quota sample ensured sufficient sample sizes. CATI used to conduct 1,200 national telephone interviews with parents of children aged 0-17 yrs. & 300 interviews with children aged 9-12 yrs. Follow up 1 survey July 2005, Follow up 2 used Woolcott Research National Consumer Omnibus- fortnightly national survey of 1,000 interviews. **Measures:** - Fruit and vegetable consumption, Attitudes and beliefs about fruit and vegetable consumption, Healthy eating and campaign awareness, Awareness of 2&5 and subsequent action. **SEP Measures:** Education – 9 categories, Income 3 categories, Employment status, Occupation	**Effectiveness:** Parents who left school before Yr. 11 and Blue collar households were less likely to consume 2 pieces of fruit/day.
Risk factor awareness		
Carleton *et al*. 1995 *The Pawtucket Heart Health Program* Aim: Total population CVD risk factor reduction.	Commercial sources were used to list all households in the city from which participant households were randomly selected. Biennial, random, independent sample, cross-sectional **face to face surveys** were completed with people aged 18 - 64 years at baseline, and during, and after education. Baseline cohorts were re-examined at 8.5 years for change in risk factor prevalence. **Measures:** - CVD risk, health habits, smoking, BP, height and weight and blood samples. **SEP Measures:** Household income, and education.	**Effectiveness:** Reduction in risk factor prevalence greatest for least educated.
Morley *et al.* 2009 *Piece of String* Campaign aimed at addressing obesity and cancer in the state of Victoria. 2007.	Pre-test–post-test control group design with **telephone interview** at pre-exposure, post-exposure and follow-up. Random recruitment from the Roy Morgan Single Source database of 55 000 previous survey participants. Inclusion criteria: overweight or obese (BMI >25 kg/m2), aged 30–69 yrs., and resided in Victoria. Sample stratified to include 50% parents of children under 17. **Measures:** -Awareness, intentions, and behaviours. **SEP Measures:** Work status, education level, household income, and IRSAD[5].	**Reach:** Ad recall higher in the less educated BUT lower in low IRSAD[5] groups.

Study Details	Evaluation Methods and Measures	Reporting of Reach/ Understanding/ Effectiveness by SEP *(continued)*
Osler & Jespersen 1993 *Slangerup – a heart healthy town*	Cross-sectional study using a **Mail-out questionnaire** to a random selection of 1092 adults 20-65 years from the Local Central Person Register in the Intervention and Control cities. Baseline with one year follow-up in a non-cohort sample. **Measures:** - 21 questions concerning: Awareness and participation in area health promotion activities. Influences of social network or mass media on health behaviour. Changes in last year. **Measures - SEP:** Education 3 categories.	**Reach:** Lowest awareness found in the least educated groups in both control and intervention cities. Significance not given. **Effectiveness:** Change in behaviour (Tried to or succeeded in smoking cessation, eating less fat, and doing more exercise) higher in the least educated in the control city.
Diet and exercise		
Wardle *et al*. (2001)- campaign penetration. BBC's *Fighting Fat, Fighting Fit* campaign. Great Britain. Aim: to increase public awareness about obesity prevention, healthy eating, and physical activity. & Miles et al. (2001) Reports on behaviour change in same study.	Cross-sectional design with random sampling of addresses on the postcode address file of private households. **Face to face** interviews conducted as part of a monthly omnibus survey for the Office of National Statistics in March 1999. **Measures:** - Prompted awareness, memory of what the campaign was about. Active involvement (sending for the registration pack) Participation (sending in registration form) **SEP Measures:** education, occupational social class. Pre-post-campaign baseline and follow-up **postal survey** of 6000 campaign registrants randomly selected from 33,474 total registrants. **Measures:** - Dietary intake (DINE[6]) Activity levels (IPAQ[7]). Weight related items. Psychological wellbeing (SF-36[8]). Eating Behaviour (DEBQ[9]). Campaign involvement score. **SEP Measures:** Simple index of socioeconomic deprivation that included highest educational qualification, employment status, housing tenure, and car ownership.	**Reach:** Awareness: least educated and lower social class less likely to recall campaign. **Understanding**: least educated and lower social class less likely to remember message. **Effectiveness:** mixed. Odds of behaviour change by Deprivation Index: Lower SEP had higher fruit and veg consumption but higher weight gain, snack consumption and lack of exercise.
Buchthal et al. (2011) *Start. Living. Healthy* Hawaii. US	Cross-sectional design. Data collected as part of a state wide, ongoing surveillance **telephone survey**. Stratified Random Digit Dialling: listed & unlisted numbers, adults from all major islands. Only data from 2007 cross sectional survey was collected immediately post campaign. **Measures:** Awareness by prompted recall of campaign name and specific messages. Media channel exposure & Perception of messages – positive to negative scale. **SEP Measures:** Highest education level and income.	**Reach:** Awareness: Lowest education & lowest income level less likely to recall campaign

[1] ISEAD: Index of Socioeconomic Advantage and Disadvantage.
[2] CATI: Computer Assisted Telephone Interview.
[3] GED: General Equivalency Diploma
[4] TARPS: Target Audience Rating Points are a standard measure of TV advertising weight. Indicates numbers within a certain demographic group exposed to an ad within a certain period of time" (Siahpush et al. 2007).
[5] IRSAD: Index of Relative SocioEconomic Advantage/Disadvantage.
[6] DINE: Dietary Instrument for Nutrition Education
[7] IPAQ: International Physical Activity Questionnaire
[8] SF-36: Short-Form 36 health questionnaire
[9] DEBQ: Dutch Eating Behaviour Questionnaire

3.1.1 A GENERAL CRITIQUE OF PREVIOUS MAJOR DATA COLLECTION METHODS AND THEIR UTILITY IN EVALUATION OF SOCIOECONOMIC RESPONSE TO MASS MEDIA HEALTH PROMOTION CAMPAIGNS

Each data collection method has arguments for and against its utility in eliciting responses across diverse population groups. Different demands will be placed on respondents according to the method, and cognitive factors such as literacy, and personal factors such as the respondent's need for privacy or anonymity can affect the quality of response and if in fact they respond at all (Bowling, 2005). Some of these arguments are discussed below and the discussion includes some of the limited information available regarding the usefulness of each method in eliciting socioeconomic response to mass media health promotion campaigns.

3.1.1.1 FACE TO FACE INTERVIEWS

Interviews in person, usually referred to as 'face to face', or occasionally 'in-home', (Miles et al., 2001), 'home-interview' (Wardle et al., 2001), 'door-to-door', or 'house-to-house' (Taylor, Wilson, & Wakefield, 1998), are considered possibly the least burdensome, and highly preferred method by survey respondents (Bowling, 2005). The burden is thought lower because the respondent is only required to speak and understand the language in which the questions are asked. Reported benefits of this mode of survey administration include a broader coverage of the sample population, high item completion possibly due to assistance of the interviewer in navigating the respondent through the questionnaire (Bowling, 2005), and also a higher survey response rate than telephone interviews (Bowling, 2005; Ekholm, Gundgaard, Rasmussen, & Hansen, 2010). Interviewers are thought to motivate people to respond, and it is suggested that the closeness of the interview situation may increase the likelihood of persons participating in a study (Hartge & Cahill, 1998). However, it has also been reported that the reverse may occur when the information being elicited is of a sensitive nature (Aquilino, 1994). Because face to face interviews require interaction with the interviewer, this mode of data collection is subject to a 'social desirability bias' in that the respondent may be more unlikely to report less than 'socially desirable' or less than 'normal' behaviour, and also give more ‘yes’ responses than for example in self-administered postal surveys (Bowling, 2005).

Reported disadvantages of face to face interviews have included the higher costs in money and time than telephone interviews (Serraglio, Carson, & Zahid 2003; Bennett & Steel, 2000; Donovan, R., D'Arcy, C., & Jalleh, 1997). Commercial costs may exceed $200 for a one hour interview (O’Toole, 1997) and hence are being used less often (Bennett & Steel, 2000). Other reported disadvantages include the safety of the interviewer, and sometimes difficult access to residences of potential interviewees (Corey & Freeman, 1990)

Despite the advantages to data quality of the face to face survey method, its utility in the evaluation of socioeconomic response to mass media health promotion campaigns has been varied. Response rates for studies using this method have ranged from 45-60% (Owen et al., 1995), 52% (Hillsdon et al., 2001), 68% (Carleton et al., 1995), and 70% (Wardle et al., 2001), and there has been little difference in the estimates due to the mode of collection when compared to telephone interviews (Bennett & Steel, 2000). Hence from a point of reduction in costs and time, the face to face interview is used far less frequently than interview by telephone (Bennett & Steel, 2000).

3.1.1.2 INTERVIEW BY TELEPHONE

Telephone interviews have the advantage of less expense, and easier administration than face to face interviews (Bennett & Steele, 2000; Donovan et al., 1997), and they may help to minimise problems of respondent literacy. This method also enables easier monitoring and standardisation of questions (Waksberg, 1978). A time efficient interview process is most often facilitated by Computer Assisted Telephone Interview (CATI) software which will also automatically perform administrative tasks such as rescheduling missed calls, logging all interviewer actions, and producing reports (Bennett & Steel, 2000).

Telephone sampling is also assisted using Random Digit Dialling (RDD) wherein phone numbers are randomly generated from a sampling frame or set of numbers rather than from a commercial list or directory. This method has the advantage of potentially accessing all telephone households through the randomness of the number generation (Brick, 2008) but also has its drawbacks. RDD may render a high proportion of non-usable phone numbers due to their use for fax machines, business outlets, modems, or simple non-connection (Taylor et al., 1998).

Other disadvantages of the telephone method may include the effects of bias on data quality. With the decline in response rates using this method the possibility of non-response bias increases (Brick, 2008) as well as bias due to poor telephone coverage in some geographic areas, minority groups and low socioeconomic groups (Frankel, Srinath, Hoaglin, Battaglia, Smith, Wright, et al., 2003). The sociodemographic characteristics of occupants of non-telephone households might differ considerably from their counterparts in households that do have telephones (Corey & Freeman, 1990).

Adequate representation of lower socioeconomic groups is a challenge for telephone sampling methods. Those who do not have a phone cannot be sampled and are thus excluded and not represented in a sample. Poor representativeness of a study population limits its generalisability to the whole population (O'Toole, 1997). Other excluded groups might include the homeless and itinerant, those in institutions, the frail and sick in hospitals, and those unable to participate in a phone interview (Serraglio, 2003).

Landline or mobile (cell) phone

There are many reports of the telephone sampling method yielding sample groups of higher SEP (Donovan et al. 1997; Wang, Dicks, Gong, Buehler, Zhao, Squires, et al. 2009). One study that found persons of lower income less likely to participate in studies via a landline telephone than via a mobile phone also noted that the demographic of the two phone type users differed significantly with regards to health and income (Hu, Balluz, Battaglia, & Frankel, 2010). Other researchers have also found that mobile phone only users differ in key characteristics pertaining to health and indicators of poorer socioeconomic circumstances (Blumberg, Luke, & Cynamon, 2006). Apart from the emerging sociodemographic differences between the users of each phone type there are some concerns about data quality and completeness. Information gathered from mobile phone users has been found to have higher proportions of missing income data than in the information obtained from mail survey respondents (Link, Battaglia, Frankel, Osborn, & Mokdad, 2006).

The rapid rise in mobile phone use has evoked concerns for valid, reliable, and representative data (Brick, 2008; Link, Battaglia, Frankel, Osborn, & Mokdad, 2007). Representativeness of a study sample needs to be established in order to infer results to a specific population (Altman, Gore, Gardner, 1983) and can be impaired for example by use of sampling frames developed for use with landline phones (Blumberg et al., 2006), hence missing the demographic of mobile phone only users. Link et al have suggested using both a mobile phone and landline frames together and stratifying the sampling but estimate costs to increase by 4-5 times (Link, 2007), significantly increasing overall study costs.

Unlisted / silent numbers

Other threats to data representativeness include the impact that unlisted numbers have on probability sampling (O'Toole, 1997). Proportions of unlisted numbers in a South Australian omnibus sample for 2002 were 20.2%, an increase from 17.3% in 1994 (Dal Grande, Taylor, & Wilson, 2005); thus these numbers are increasing and a large proportion of the population may not be represented. Further exploration of the socioeconomic circumstances of the unlisted number sample revealed that the reason given by the largest proportion of the sample (33.3%) for having an unlisted number was that they did not want to be contacted by market research or selling callers. The highest proportions of respondents were of lowest SEP (22.2%), lowest SEIFA (Socioeconomic Index for Areas) score (27.2%), and unemployed or not working because of a work injury (25.0%). Most had a yearly household income of less than $20,000 (21%), and most had educational attainment of secondary school or lower

(21.4%). These results indicate a possible source of self-selection bias of persons predominantly in lower socioeconomic circumstances.

3.1.1.3 MAIL / POSTAL SURVEYS

Surveys by mail are a financially feasible method of collecting data from large and widespread populations (Edwards, Roberts, Clark, DiGuiseppi, Pratap, Wentz, et al., 2002; Faria & Dickinson, 1992), and more households with landline telephones and to a greater degree, mobile phone only households, can be reached by mail surveys (Link et al., 2006). One disadvantage of the mail-survey is the lack of interviewer control over the order in which questions are presented. The survey may be formatted in a particular way so that respondents complete certain questions before they are influenced by the information in others. Any advantage that can be gained from this order of questions might be negated, however, when a respondent decides to look through the whole questionnaire and may adjust their responses by way of information gained (Bowling, 2005). The greatest threat however to the validity of mail surveys, is the lack of generalisability if response rates are less than 60% (Price, Murnan, Dake, Dimmig, & Hayes, 2004).

Response rates over the last few decades have benefited greatly from evidence based strategies designed to improve completion and return of questionnaires (Dillman, 2000; Edwards et al, 2002). Missing data rates however have been found significantly higher in mail surveys than telephone and face to face interviews (Van Campen, Sixma, Kerssens, & Peters, 1997). Conflicting with these findings in so far as income data however, Turrell (2000) found that compared to telephone interviews, mail surveys tend to have the lowest incidence of income non-response. This finding is important in that low income is a frequently occurring indicator in the above descriptions of poorly represented groups in telephone surveys (Link et al, 2006) and thus gives strength to the use of mail survey research to reach individuals in such circumstances.

3.2 CHOICE OF SURVEY METHOD FOR THE CURRENT STUDY

The choice of mail survey for the current study is supported by the above information. Although the face to face interview is more likely to promote completeness of data; in terms of cost to a PhD budget, timely completion of sufficient interviews, and ensuring security for a female interviewer, the face to face interview method of data collection was excluded. Telephone interview was ruled out due to the significant expense of the Computer Assisted Telephone Interview (CATI) method. An example of the cost of this system to recruit similar numbers to a health survey is provided by The Australia Institute in their comparison of use of CATI versus internet survey (Bambrick, Fear, & Dennis, 2009). The method provided a 65% response rate, used 26 interviewers, took one month to complete, and cost $51 364. These costs were far beyond any consideration for the current study. As portrayed above, the telephone method also tends towards bias against lower socioeconomic respondents. Because the primary focus of this study is to ascertain differences in socioeconomic group response, and lower socioeconomic groups are known to be less responsive to surveys, it would have been unwise to add to this challenge by choice of a survey method that is documented to under-report income data (Link et al., 2006), and exclude non-telephone households (Corey & Freeman, 1990).

It is recognised however that there are also limitations to the mail survey method, a major consideration is that of literacy and health literacy. Completion of a mail survey requires a level of literacy adequate to understand and answer the questions. It was judged that the required level would be consistent with that necessary to understand the language and health terminology used in *Measure Up* campaign advertisements and literature. Persons who could not read or understand the survey and the campaign advertisements were unlikely to complete the survey. Hence associations between SEP and reach, understanding, and effectiveness were likely to be underestimated and understated.

3.3 THE AUSTRALIAN BETTER HEALTH INITIATIVE (ABHI) *MEASURE UP* CAMPAIGN

In July 2006 the Council of Australian Governments (COAG) launched the Australian Better Health Initiative (ABHI), a four year national program to reduce risk factors that contribute to chronic disease and minimize the occurrence of new cases (Australian Better Health Initiative, 2006). Included in this program was the mass media health promotion campaign *Measure Up*, launched in October 2008. By targeting the relationship between overweight, obesity, and lifestyle related chronic disease, *Measure Up* aimed to raise awareness of healthy lifestyle choices to help protect against diseases such as Type 2 diabetes, cardiovascular disease and some cancers (ABHI, 2006). The campaign also aimed to increase appreciation of self-assessment and individual's personal susceptibility to chronic disease through preventable lifestyle factors.

Multiple mass media channels were used to deliver campaign information that targeted the relationship between overweight, obesity, and lifestyle related chronic disease. The campaign featured an iconic tape measure on all information items so as to promote the main message of raising awareness of waist line measurement and healthy lifestyle choices (ABHI, 2006). Waist circumference is useful in identifying abdominal obesity, which in particular has been associated with insulin resistance and subsequent diabetes and cardiovascular disease (Pi-Sunyer, 2002). Guidelines for a healthy waistline and the association of increasing measurements with increasing potential for ill health are depicted in TV, radio, and print media in the form of newspapers, magazines, large posters and smaller posters on shopping trolleys.

The campaign also assists people to understand why they may need to change their lifestyles. A dedicated website (the address of which is on all campaign advertisements and literature) facilitates access to resources on healthy diet, healthy recipes, physical activity, and advice on how to include more of these healthy behaviours into each day. Fact sheets on related topics such as chronic disease, abdominal fat, and many more, are available online (ABHI, 2006).

The primary target audience for the *Measure Up* campaign was the 25 to 50 year old age group, postulated to change to healthier lifestyle behaviours and thus influence their children. The secondary target audience (and the target population of this research thesis) is the 45 to 60 year old group whom it is thought may be experiencing the consequences of an unhealthy lifestyle, or may have already been diagnosed with a chronic disease (ABHI, 2006).

3.4 RESEARCH DESIGN OF THE CURRENT STUDY

A cross-sectional observational design was used to deliver a postal questionnaire to randomly selected Brisbane residents aged 45-60 years. A pilot study preceded the main survey. The mail-out of the questionnaire and associated information were administered using the Tailored Design Method (Dillman, 2000) known to optimise postal questionnaire response rates.

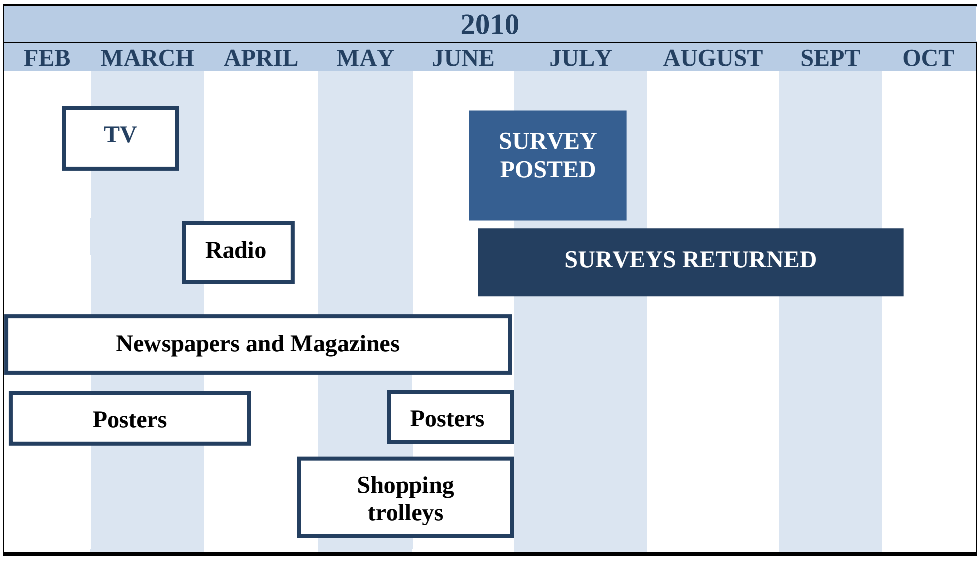
3.4.1 SCOPE AND TIMING OF THE RESEARCH

The study was undertaken in the 9 Federal electorates that comprise the statistical sub-division of Brisbane. In 2010, the year in which the survey was conducted, Brisbane's population was 2.043 million (ABS, 2011). The survey was mailed to 1,740 potential recipients. The timing of this mail-out was impacted by *Measure Up* campaign advertising, particularly TV advertisements.

The first phase of the *Measure Up* campaign included four flights of media activity in October/November 2008, March/April 2009, September 2009 and March 2010 (The Social Research Centre, 2010). Bursts or 'flights' of campaign communication activity typically included a four week block of television advertising (see Figure 3.1) supported by radio, print, out of home and on-line media (The Social Research Centre, 2010). The third flight of the *Measure Up* campaign was underway (see Figure 3.1) when the survey for this research thesis entitled *'How's Your Health'* was posted. The survey examined 45-60 year old Brisbane residents' responses to the campaign and understanding of the health related language.

Set rules for the timing of a mass media health promotion campaign impact questionnaire are not established in the literature but short term measures are usually carried out 4-6 weeks after the campaign (Bauman et al, 2006). Mail-out dates for this study survey however had a logistical focus in that avoidance of school holidays was important to ensure that potential respondents would be at home to receive the questionnaire. As well, the meeting of the author's academic requirements meant that the mail-out could not commence until after 12 June 2010. These restrictions meant that mail-out began 11 weeks after the completion of the *Measure Up* TV ad component and 7 weeks after the radio ad component. Newspaper and magazine advertisements, and posters in bus stations and shopping centres were currently on show during the survey period. Timing of survey mail-outs with regards to *Measure Up* 'flights' (The Social Research Centre, 2010) are depicted in Figure 3.1.

Figure 3.1 Mail-out timeline and Measure Up advertising activity



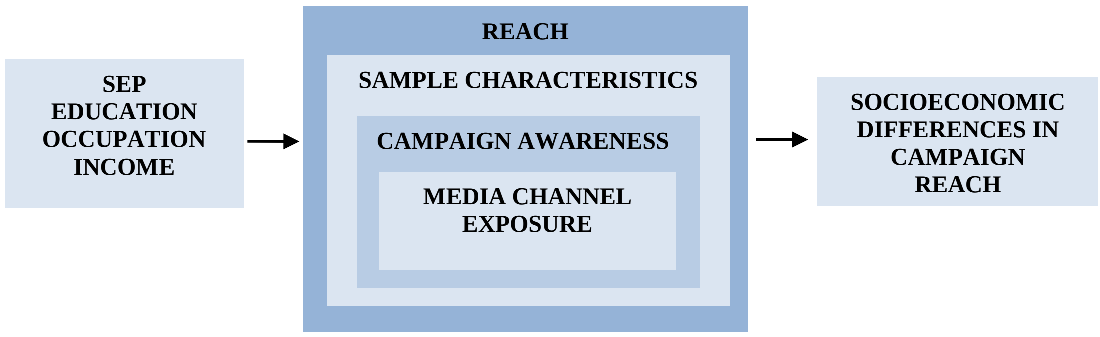
3.4.2 DEVELOPMENT OF THE SURVEY INSTRUMENT

The questionnaire entitled *'How's Your Health',* was developed for this study to investigate in a sample of 45-60 year old Brisbane residents, the assumption that socioeconomic groups respond differently to mass media health promotion efforts. Data collected included responses to the *Measure Up* campaign, understanding of the health related campaign language, and sociodemographic information. The questionnaire is discussed firstly in terms of items that elicit information to address each research question; and secondly in terms of structure and flow of items.

3.4.2.1 ITEMS ADDRESSING RESEARCH QUESTION 1: *What is the relationship between SEP and reach in mass media health promotion campaigns?*

Socioeconomic differences in campaign reach were explored by ascertaining respondent awareness of the campaign and the media channel/s by which they were exposed to the advertisements. The items establishing SEP included respondents' highest education level, current employment situation, current occupation, and total household income. These items were adapted from items used in the HABITAT Study (Burton, Haynes, Wilson, Giles-Corti, Oldenburg, Brown, et al. 2009). Campaign awareness was determined by asking respondents whether they had seen or heard advertisements from the *Measure Up* campaign and the reader was referred to a frequently used campaign image on the same page. A 'Yes' or 'No' answer was required. This style of item using recognition of an image to assist recall was used in the 2001 National Tobacco Campaign evaluation research (Kinsman & Taylor, 2003). An item regarding the media channel by which respondents were exposed served as both confirmation of awareness as well as to differentiate socioeconomic group differences in the preferred media channel/s. This item only required a 'Yes' or 'No' answer for each media channel. Figure 3.2 depicts relationships between items determining SEP differences in campaign reach.

Figure 3.2 Relationships between SEP and items determining campaign Reach

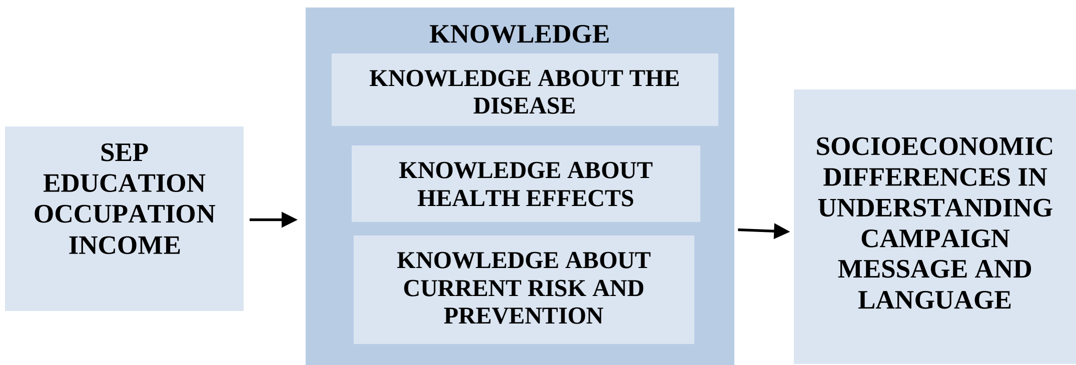


3.4.2.2 ITEMS ADDRESSING RESEARCH QUESTION 2: *What is the relationship between SEP and understanding of mass media health promotion campaign messages and language?*

Respondent understanding of the campaign message and language was explored by items developed from published studies (ABS, 2009b; Burton, Turrell, & Oldenburg, 2003; Fjeldsoe, Miller, & Marshall., 2009; Heistaro, Janus, & Dunbar, 2007; McLennan & Podger, 1998; Queensland Cancer Fund, 2005; Saunders, Aasland, Babor, De La Fuente, & Grant, 1993), information from the *Measure Up* website (Australian Better Health Initiative, 2006), and information obtained from websites related specifically to each chronic disease, diabetes (ABHI 2006b; Diabetes Australia-Queensland, 2008a, 2008b, 2008c), heart disease (Heart Foundation 2010a, 2010b , 2010c , 2010d) and cancer (Cancer Council of Australia, 2007-2009, 2010a, 2010b). A table depicting the source of each item or the source of information used in the development of each item is located in Appendix B.

For people to make decisions about avoiding risk, they need at a minimum to understand the nature and likelihood of the risk, the harm that might occur, and the ease or difficulty of the preventive action necessary to avoid the risk (Weinstein, 1999). Thus knowledge items were similarly grouped, namely knowledge about the disease, knowledge about the health effects if the person has the disease/risk factor, and knowledge about their current risk of chronic disease and how to prevent it. Knowledge items addressed each Chronic Disease Risk Factor (CDRF) terminology area. Figure 3.3 depicts the relationship between SEP and knowledge items to socioeconomic differences in understanding the campaign message and language.

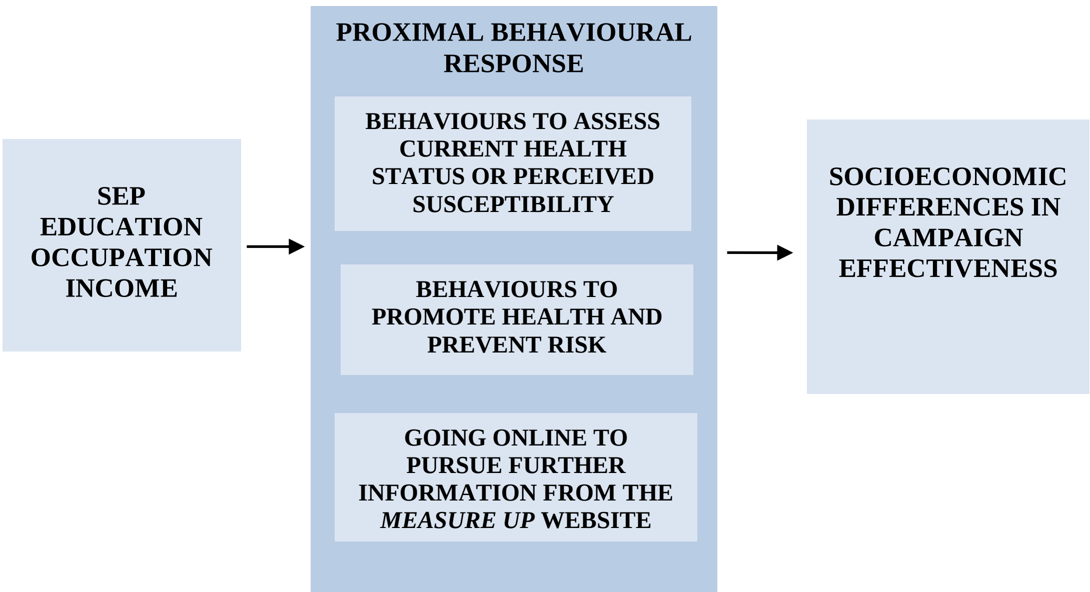
Figure 3.3 Relationships between SEP, knowledge concepts and socioeconomic differences in understanding the campaign message and language



3.4.2.3 ITEMS ADDRESSING RESEARCH QUESTION 3: *What is the relationship between SEP and effectiveness of mass media health promotion campaign messages in terms of proximal behavioural response?*

Questionnaire items addressing Research Question 3 focus on whether the *Measure Up* campaign prompted respondents to engage in proximal (short-term) behaviours recommended by the campaign. These items, developed from information on fact sheets available on the *Measure Up* website, asked the respondent whether the campaign had prompted them to engage in each behaviour. The behaviours were all able to be engaged in within a short period of time and included taking waist and weight measurement to assess current health status or perceived susceptibility, increasing fruit and vegetable consumption and exercise to promote health and prevent risk, and talking to their doctor about prevention of chronic disease. Two further items addressed *Measure Up* advertisement effectiveness in prompting respondents to go online to the website and if they did, their reasons for doing so. Also addressed was whether respondents had computer access or not. The items regarding reasons for going online were developed using menu options from the website regarding types of health information available on that website. For example, to send away for the tape measure and information kit. Figure 3.4 depicts relationships between SEP and prompting of proximal behaviours by the *Measure Up* campaign to demonstrate campaign effectiveness.

Figure 3.4 Relationships between SEP, engagement in proximal behaviours, and socioeconomic differences in campaign message effectiveness



Questionnaire structure and flow

The questionnaire was structured into three main sections; the first contained items about the respondents' own health and lifestyle and risk factor status, parental history of chronic disease; and knowledge about the chronic disease and risk factor terminology. The second section began with the *Measure Up* image, and items concerned respondents' awareness and response to the *Measure Up* campaign. In the third section, items concerned respondents' biological parameters such as weight, height and waist measurement, and sociodemographic information about themselves and their household. The image of the man walking along the tape measure was placed as far into the questionnaire as possible so as not to influence respondents' answers to the first section.

3.4.3 QUESTIONNAIRE READABILITY

In a questionnaire aimed to elicit differences in participant understanding of health language, an estimation of the extent to which survey items and instructions matched the reading abilities of the target population will assist interpretation of results (Calderón, Morales, Liu, & Hays, 2006). Calderon reports that even though readability of health information materials has been reported for decades, there has been little assessment of the readability of mail surveys nor item by item variation in readability. In addition, population level reading abilities of survey respondents is infrequently reported.

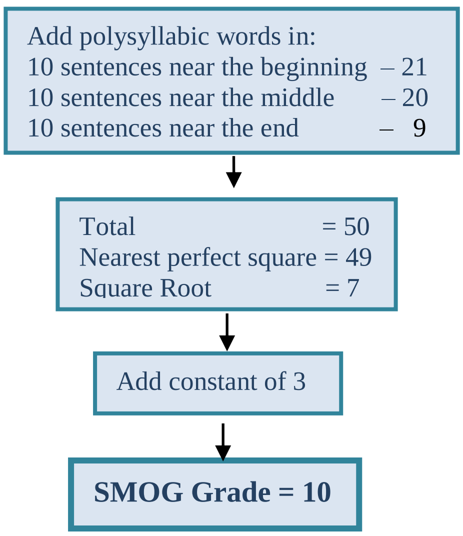
Items in this study's *"How's Your Health"* survey were assessed in order to report participants' likelihood of understanding the items. Three readability formulae commonly employed to assess health literature, and highly correlated with other instruments (Hedman, 2008), were used. They included the SMOG (Statistical Measure of Gobbledygook), the Flesch Reading Ease (FRE), and Flesch-Kincaid Grade (FKG) level tools. Readability tools frequently differ on estimates of the same text (Burke & Greenberg, 2010) and caution is advised in their interpretation.

FKG is reported to score lower than other estimates and SMOG is reported to score higher. Burke and Greenberg (2010) recommend averaging the results of the two formulae and this was the approach taken for this study. Also notable is that the estimates are presented in American school grades not directly comparable to the Australian education system. McKenna et al (2007) consider a Flesch–Kincaid grade level of 8 to translate to the reading age of a 13-year-old in Australia, which is 8 years of schooling if the child started school at 5 years of age. Table 3.2 depicts both original SMOG, FRE, and FKG estimates for this study survey and average estimates.

3.4.3.1 SMOG GRADING

McLaughlin (1969) explains 'SMOG Grading' as a depiction of the relationship between the ease with which persons read a given text and a count of the linguistic characteristics of that text. Words of three syllables or more are used as the measure, as well as sentence length subsumed in the formula. The underlying principle is that the number of polysyllabic words is related to sentence length. Manual calculation of the SMOG grade for this study survey is depicted in Figure 3.5. The resulting readability grade is an estimate of the number of years of education required to fully understand the text (McLaughlin, 1969). SMOG Grading of the questionnaire used in this study is estimated to be 10.1. In terms of American education levels McLaughlin suggests this grade is consistent with 'some high school' and ability to understand text at the level of 'Newsweek' magazine (PsychAssessment.com.au, 2012, p12).

Figure 3.5 Calculation of SMOG Grade for study questionnaire



3.4.3.2 FLESCH READING EASE AND FLESCH-KINCAID GRADE LEVEL READABILITY ESTIMATES

Both FRE, and FKG estimates are suitable for all reading levels and are readily available online in Microsoft Word. The FRE score is presented as a number between 1 and 100. The higher the number, the easier the text is to read and the more people there are who can understand the document (Burke & Greenberg, 2010, p35). The FKG score is also based on the number of polysyllabic words and sentence length similarly to the SMOG index.

3.4.3.3 LIMITATIONS OF READABILITY FORMULAE

Most classic readability formulae were developed and validated on children using text and learning materials for that age bracket. All participants' capabilities are assessed as equal (Burke & Greenberg, 2010, p.40); there is no account taken of the individual's familiarity with words in the text that may occur over time. In this study population aged 45-60 years participants are not equal; all have become familiar to varying degrees by their own, and family's and friends' life and illness experience.

3.4.4 READABILITY ESTIMATES FOR THE *'HOW'S YOUR HEALTH?'* QUESTIONNAIRE

Table 3.2 depicts readability estimates for this study's questionnaire *How's Your Health*. Average SMOG and FKG scores in the *'How's your health?'* survey indicate a requirement of between 7.6 and 11.5 years of education to read and understand the items. Items regarding knowledge of lifestyle related chronic disease (LRCD) scored an FRE level classed as 'very difficult' (0-30) and readable by 'college graduate' (PsychAssessment.com.au, 2012, p14). More readable were the LRCD risk items classed as 'difficult' (30-50) and readable by persons with 13 – 16 years of education. Five sections with scores ranging 50-60 are classed as fairly difficult requiring 10-12 years of education. Four sections scoring between 60-70 are classed as 'standard' difficulty level suitable for those with 8-9 years of education, whilst 3 sections are classed as 'fairly easy' requiring 7 years of education.

Table 3.2 Readability and item statistics for '*How's Your Health'* questionnaire

How's Your Health Survey Section	SMOG[1] Grade 10.1 Polysyllabic count	FRE[2] Index *x*	Minimum item FRE	Maximum item FRE	FKG[3] *x*	Average SMOG + FKG
Current risk	21	54.0	41.5	74.8	9.4	9.8
Knowledge LRCD[4]		24.7	0.00[5]	61.8	13.0	11.5
Risk LRCD		48.6	37.2	56.9	11.7	10.9
Knowledge T2D[6]		53.0	29.4	75.1	10.1	10.1
Knowledge HD[7]		65.3	30.9	86.7	7.9	9.0
Knowledge Cancer	20	60.1	25.4	90.10	8.7	9.4
Knowledge Bodyweight		68.7	18.4	89.8	8.6	9.4
Awareness *Measure Up*		76.7	60.7	92.9	5.1	7.6
Agree *Measure Up*		56.0	11.4	100.00	8.3	9.2
Measure Up online		52.6	0.00[8]	95.10	8.2	9.2
Personal demographics	9	71.5	31.5	90.90	5.2	7.7
Exposure		74.9	56.20	86.60	5.5	7.8
SEP		55.9	11.00	95.9	8.3	9.2
Finalities (last page)		65.5	64.20	66.8	8.3	9.2

[1] SMOG: Statistical Measure of Gobbledygook = 10.1
[2] FRE: Flesch Reading Ease readability estimate (higher score = easier readability).
[3] FKG: Flesch-Kincaid Grade level readability estimate (lower the score the lower the reading level needed).
[4] LRCD: Lifestyle Related Chronic Disease.
[5] Item: *"Lifestyle related chronic disease can be prevented by regular physical activity"*
[6] T2D: Type 2 Diabetes.
[7] HD - Heart Disease.
[8] Item: *"Find information about becoming more physically active"*

Later in this section (Table 3.3) at the item level, and including the SMOG grading for this study survey, statistical comparisons are made between the *"How's Your Health?"* survey and reported estimates of knowledge questionnaires from the published literature concerning similar subject matter (Wagner, Lacey, Chyunb, & Abbott, 2005; Swift, Glazebrook, & Macdonald 2006; Mackison, Wrieden, & Anderson, 2010; Wang, Gallo, Fleisher, & Miller, 2011).

3.4.4.1 IMPLICATIONS FOR THIS STUDY

Clearly the average SMOG and FKG scores for the sections regarding knowledge about lifestyle related chronic disease (LRCD), and participants' risk of LRCD, were higher than the rest of the survey and not optimal. The items in these two sections were developed from information on the ABHI *Measure Up* website, one of the purposes of which was an online population resource for information about LRCD. Hence, the poorer readability estimates of the survey may have implications for the readability of information on the website.

Ascertaining peoples' understanding of campaign topics without using words that relate to the subject matter of the campaign is challenging. Polysyllabic words used in the two above sections of items include*; disagree, following, related, diseases, elderly, medication, prevented, regular, physical, activity, anything, measurement, physically, and regularly*. These words were used in campaign information and directly related to the campaign focus. However, justification for use of such words in a survey that examines understanding does not discount that some items may have been difficult in themselves. Reliability estimates may have been affected because participants may have interpreted the items differently each time. Also, if an item is not well understood it is by chance that a correct answer is given and hence the quality of some data impaired. With this in mind though, even putting aside the issue of data quality, I argue that understanding the *Measure Up* campaign language is too difficult for those with low levels of schooling.

3.4.4.2 COMPARATIVE READABILITY ESTIMATES

Despite FRE estimations of many items being generally difficult, the study survey compares favourably with other knowledge assessment surveys in the published literature (Table 3.3). FRE estimations of items in the *"How's Your Health?"* survey range from 53.0 - 68.7 compared to 62 - 64.7 in comparison studies. A lack of information in the comparison studies precluded average FKG and SMOG comparisons, however, available FKG scores, 8.0 for heart disease and 8.4 for health risks/ obesity, compare well with similar items in the *"How's Your Health?"* survey, 7.8 for knowledge about heart disease and 8.6 for knowledge about body weight. The SMOG grade could be compared with one study (Wang et al., 2010) that scored an average of 12.0 whilst similar items in the *"How's Your Health?"* survey scored 10.1.

Table 3.3 Comparative readability estimates between questionnaires similar in knowledge content to '*How's Your Health?*'

	Comparison study estimates				*How's Your Health*			
Questionnaire knowledge content	**Authors**	**FRE[1] %**	**FKG[2]**	**SMOG[3]**	**Similar survey section**	**FRE %**	**FKG[4]**	**SMOG[4]**
Heart Disease / Diabetes	Wagner et al., (2005)	62	8.0	-	Knowledge HD Knowledge T2D	65.3 53.0	7.8 10.1	10.1
Understanding food labels	Mackison et al., (2010)	64.7	-	-	Current risk	4.0	9.4	10.1
Cancer knowledge / Family history assessment (multiple studies)	Wang et al., (2010)			8.7-14.2 Av = 12.0	Knowledge Cancer	60.1	8.7	10.1
Health risks / Obesity	Swift et al., (2006)	-	8.4	-	Knowledge Bodyweight	68.7	8.6	10.1

[1] SMOG - Statistical Measure of Gobbledygook = 10.1
[1] FRE - Flesch Reading Ease readability estimate (higher score = easier readability).
[3] FKG - Flesch-Kincaid Grade level readability estimate (lower the score the lower the reading level needed).
[4] Original scores (not averages) presented.

3.5 PILOT STUDY

Determining whether understanding of the health related language used in a mass media campaign differs by socioeconomic position is a major focus of this study. Reading level estimates indicated that low education levels may have difficulty and thus it was important to ascertain as far as possible, that the language used in the survey was appropriate, that instructions were clear and items were able to be understood by persons from a variety of socioeconomic backgrounds. On Ethics Unit approval of the questionnaire, a pilot study was carried out.

3.5.1 METHOD

3.5.1.1 RECRUITMENT

Recruitment of a sample that represented each socioeconomic level was approached in a number of ways. Lower income persons residing in subsidised housing home units were recruited by response to a flyer placed in the letter box of each home unit (Appendix C1). A local not for profit business was approached, and with permission from the manager, persons were invited by email and volunteered to participate in the pilot study. These individuals became pilot subjects in the lower and middle income categories, whilst higher income persons were recruited by word of mouth through the author's social network. A $20 gratuity was given to respondents for a completed survey and follow-up phone or personal interview. A table of participant characteristics can be found in Appendix C2.

3.5.1.2 CONDUCT OF PILOT STUDY

Respondents contacted the researcher by phone. The purpose of the pilot study was explained and arrangements made for delivery of written instructions (Appendix C3) and the draft study questionnaire. Participants were asked to mark the questionnaire or make notes of areas of concern to promote quality of the feedback. On completion of the questionnaire, participants phoned to arrange follow-up interviews and these were conducted by phone or face to face with the author, and all comments documented. Discussion included time taken to complete the questionnaire, general impression, clarity of instructions, difficult or confusing words or items, and anything that the participant thought worth mentioning.

3.5.1.3 RESULTS AND SUBSEQUENT REVISION OF QUESTIONNAIRE

Comments were discussed with the supervisory team and the actions taken are documented in Appendix C4. The amended questionnaire was returned to the University Research Ethics Unit and approved for use in the main study (No. 1000000199).

3.6 MAIN STUDY

3.6.1 SAMPLE

3.6.1.1 SAMPLE SIZE

Sample size was calculated using proportions data from the Brisbane Food Study (Turrell & Kavanagh, 2006). In that study with a similarly sampled population, significant differences between socioeconomic groups in results of a food and nutrition knowledge questionnaire were analysed. Sample size was calculated using the formula recommended by the QUT Research Methods Group (Battistutta, 2007) resulting in a minimum number of 1740 participants to be invited to participate in the study. This sample size allowed for a 60% response rate and would give a power of 80% to detect a significant difference (two-tailed) between socioeconomic groups. Appendix D includes details of the sample size calculation.

3.6.1.2 SAMPLE SELECTION

An extract of data that included the name, address, date of birth and gender of 17400 persons (45-60 years), randomly selected from 9 federal electorates comprising the statistical sub-division of Brisbane, was obtained from the Australian Electoral Commission (AEC). These randomly sampled data stratified by electoral sub-division were further randomly sampled to obtain a sample size of 1740 residents. The selection of the age group studied in this research was determined by the age range of the secondary target group of the *Measure Up* campaign. This 45-60 year old group are found to have high incidence of risk factors and onset of chronic disease, a major focus of the *Measure Up* campaign (ABHI, 2006a).

3.6.2 DATA COLLECTION

3.6.2.1 THE TAILORED DESIGN METHOD

Data collection was managed using the method developed by Dillman (2000) and included a series of 5 mail-outs (letters - Appendix E) over 6 weeks and comprehensive database management to minimise unnecessary correspondence to residents who had already returned the questionnaire or not wishing to participate.

The Tailored Design Method is supported by systematic review evidence of maximised response rates (Edwards et al., 2002) and includes:

1. A pre-notification letter sent at week 0.
2. A questionnaire pack including a letter from the researchers, a questionnaire, and a return addressed envelope, sent one week after the pre-notification letter.
3. A postcard sent 1 week later, serves as both a 'thank you' and a 'friendly reminder'.
4. A replacement questionnaire pack sent 3 weeks after the first questionnaire to those who have not responded.
5. A final reminder is sent 2 weeks after the replacement questionnaire.

1740 questionnaire packs were sent to the randomly selected potential participants. Surveys were returned over the next few months numbering 1065 usable surveys achieving a response rate of 61.5%.

3.6.2.2 DATA PREPARATION

Maximisation of data quality was facilitated using a number of methods:

i) A coding manual was prepared and utilised throughout data entry to ensure consistency of data coding.

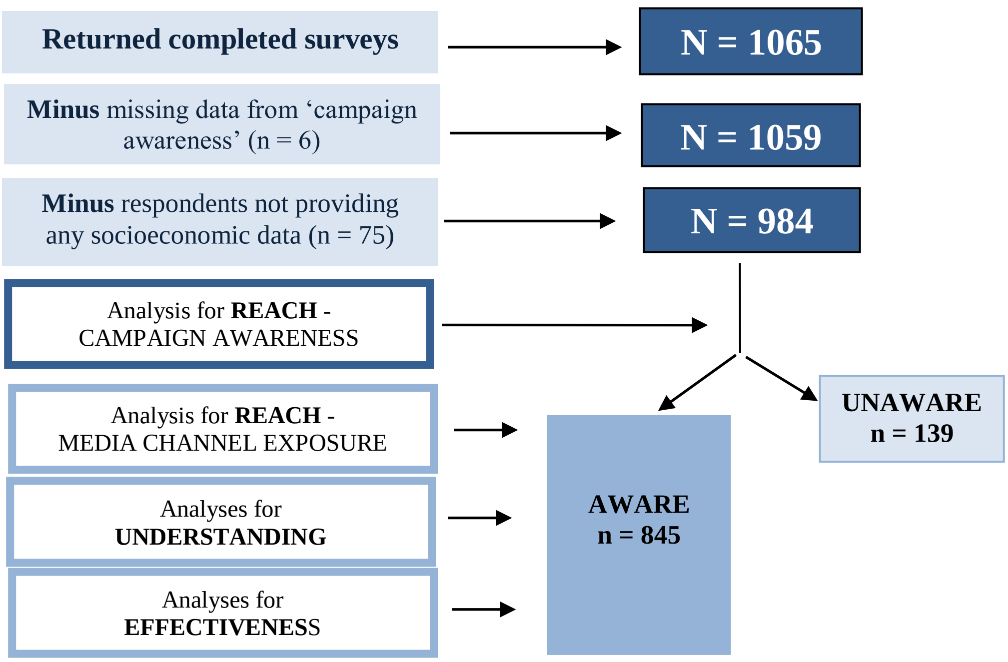
ii) Data were inspected and entered by the researcher into PASW (SPSS) Version 18 and a randomly selected 10% of each entry batch rechecked for errors.

iii) Frequency distributions were performed on variables prior to analysis and missing data and incorrect code numbers were checked and corrected against study surveys.

3.6.2.3 DEFINITION OF THE ANALYTICAL SAMPLE

The steps taken in defining the sample (Figure 3.6) were aimed to simplify analysis and interpretation, and provide greater clarity in presentation of the results. In conjunction with the supervisory team it was decided that in view of the central role of the *Measure Up* campaign as a medium around which to conduct this research, participants with missing data on campaign awareness (n = 6) were removed. This reduced the sample from 1065 to 1059. Further, in view of the socioeconomic focus of the thesis it was decided that cases not contributing data on SEP (n = 75), should also be removed.

Figure 3.6 Definition of analytical samples



3.6.2.4 SOCIODEMOGRAPHIC CHARACTERISTICS OF THE 2009 SURVEY SAMPLE: COMPARISON WITH ABS 2006 CENSUS DATA

Table 3.4 presents data describing both the total sample (N= 1059), and the analytic sample (N=984). The analytic sample comprised respondents who provided at least one item of data regarding SEP (details depicted above in Figure 3.3). This table illustrates that when compared to 2006 ABS Census data (ABS, 2011) for the same geographic area, the original and analytic samples closely reflect the Brisbane population. However, as is not uncommonly found in research collecting socioeconomic information and especially using a mail survey method, those of higher SEP are over-represented and those of lower SEP are under-represented (Turrell, 2000) compared with the general population.

Table 3.4 Sociodemographic characteristics of the original and analytic samples compared to 2006 ABS Census data

	Total Sample[1] (N=1059)		Analytic Sample[2] (n=984)		Australian Bureau of Statistics (ABS) Census data for relevant 2006 Brisbane population (N = 240,394)	
	N	%	N	%	N	%
Gender						
Females	568	53.6	520	52.8	122,680	51.0
Males	491	46.4	464	47.2	117,714	49.0
Age						
45 – 50 years	376	35.5	343	34.9	98,292	40.0
51 – 55 years	333	31.4	313	31.8	74,530	31.0
56 – 60 years	350	33.1	328	33.3	67,572	28.1
Education Level						
Bachelor degree or higher	358	33.8	358	36.4	52,892	22.0
Diploma / Associate degree	133	12.6	133	13.5	21,764	9.1
Certificate / Trade	168	15.9	168	17.1	34,836	14.5
No post-school qualification	321	30.3	321	32.6	104,412[3]	43.4
Missing[4]	79	7.5	4	0.4	26,490[5]	11.0
Occupational Group						
Managers Professionals	399	37.7	400	40.7	68,446	28.5
White collar workers	274	25.9	273	27.7	70,796	29.5
Blue collar workers	133	12.6	133	13.5	46,435	19.3
NEC[6]	166	15.7	166	16.9	-	-
Missing[7]	87	8.2	12	1.2	54,717	22.7
Household Income[8]						
High	275	26.0	275	27.9	-	-
Middle	262	24.7	262	26.6	-	-
Low-middle	231	21.8	231	23.5	-	-
Low	92	8.7	92	9.3	-	-
Missing	199[9]	18.8	124[10]	12.6	-	-

1 Total sample N=1059 excludes 6 items of missing data from awareness of campaign.
2 Total sample N=984 excludes 6 items of missing data from awareness of campaign, and 75 respondents who did not give at least 1 item of socioeconomic data.
3 ABS proportions also include those with no educational attainment.
4 Includes only respondents who did not answer the question re. Education level.
5 ABS proportions also include those providing inadequate descriptions of their highest educational attainment.
6 NEC includes 11 respondents whose occupations were not easily classifiable, 10 studying, 13 unemployed, 30 permanently unable to work, 52 retired, and 50 engaged in home duties on a full time basis.
7 Includes only respondents who did not answer the question re. Occupation.
8 Household Income: AU$, High: > $130,000, Middle: $72,800 - $129,999, Low-middle: $31,200 - $72,799, Low: < $31,199.
9 Includes 98 respondents who did not answer the question regarding their income, 8 respondents who did not know their income, and 93 respondents who chose the option of not wishing to answer the question.
10 Includes 25 respondents who did not answer the question regarding their income, 8 respondents who did not know their income and 91 respondents who chose the option of not wishing to answer the question.

3.6.3 MEASURES AND ANALYSIS

This section describes how the information to address the research questions was measured and analysed. The first section describes measures for the main independent (explanatory) variables, education, occupation, and yearly household income, used to measure socioeconomic position. The second section describes the co-variates age and gender. These five variables are used in the majority of analyses throughout the study. The third section describes the main dependent (outcome) variables and is presented under the headings of each research question. Details of analysis and the associated analytical plan is presented at the end of each section.

3.6.3.1 MEASUREMENT AND ANALYSIS OF THE MAIN INDEPENDENT (EXPLANATORY) VARIABLES: EDUCATION, OCCUPATION AND INCOME

The accurate measurement of SEP is challenging whether one uses single or multiple indicators (Dutton, Turrell and Oldenberg, 2005). The choice of indicators should be guided by the influence that the indicator is likely to have on the outcome variables of interest and the group being studied (Dutton et al., 2005), as well as the purpose of the research (Martelin, Koskinen & Valconen, 1998) and objectives of the study (Galobardes, Lynch & Davey Smith, 2007). Measurement of multiple indicators will help tease out through a regression model the relative contributions each has in affecting the outcome variable of interest. The frequency distribution of these variables in the current study is included in Table 3.4.

Area level information may have added more specific description to awareness and exposure. However, in the absence of requested information from the *Measure Up* program regarding distribution of still advertisements in shopping centres, supermarkets and bus shelters, area level information as a socioeconomic indicator was not seen to be an important aspect of the overall picture of socioeconomic position in the current study. As well, this additional level of analysis involved cluster sampling which in turn required a larger sample size than that permitted by budget constraints.

Rationale for use of socioeconomic indicators

The measurement of SEP can help explain causal mechanisms by which health differences are generated (Galobardes, Lynch, and Davey Smith, 2007). However, a large volume of literature supports the idea that "no single 'factor' accounts for the link between socioeconomic position and health" (Krieger, Williams, & Moss, 1997). Individuals' health is harmed by living standards, conditions of work, and their social and psychological exchanges with those they live, work, play and generally function with on a public scale (Krieger et al., 1997).

Such a gamut of possible causative factors underpins the importance of tailoring the choice of socioeconomic indicators to the purpose of the study (Galobardes, Lynch, and Davey Smith, 2007). The use of too few or the wrong socioeconomic measures thus may preclude important information in a study outcome. For example in this study, if only educational data are collected but the reason that they did not see the *Measure Up* campaign was because their low income left them unable to afford a television, then the data will not adequately describe the story.

Because measurement of SEP is a multidimensional construct (Dutton et al., 2005, p xi) and the use of specific indicators has been shown helpful in gaining insight into the mechanisms that generate socioeconomic inequalities in health (Galobardes, Shaw, Lawlor, Lynch, & Davey Smith, 2006), the choice of indicators was guided by the information required to best address the research questions (Galobardes et al., 2007). An inclusive approach to the collection of socioeconomic data is essential for meaningful comparison of the effectiveness of health interventions, the monitoring of differences between time-points, and indeed the monitoring of change between population groups (Galobardes, Lynch, and Davey Smith, 2007) as performed in the current study.

Three traditional measures of socioeconomic position; education, occupation, and yearly household income (Dutton et al., 2005, p. xi; Galobardes, Lynch, & Davey Smith, 2007) are used in the current study. These indicators have been shown a weak to moderate correlation with each other and individually show different patterns and strengths of association with health (Dutton et al., 2005, p xi).

The measurement of education level is thought to most capture knowledge capabilities in the individual (Galobardes et al., 2007), and is particularly important in the current study because knowledge underpins understanding of the health message and health related language. Education is stable across the adult lifespan usually having been attained before illness or life situations might detrimentally affect occupation or income (Dutton et al., 2005). Also, the acquisition of knowledge begins early in life, and thus education is the indicator most likely to reflect the individual's life course socioeconomic position (Krieger, Williams, & Moss, 1997). Ironically, however, the stability of education as a socioeconomic variable is that which limits its comprehensiveness. Education level does not capture the life circumstances of adulthood that might change and adversely affect health (Dutton et al., 2005). Individuals' knowledge about health and access to health might change because of life circumstances and thus it is argued that neither education, occupation, nor income measured alone may be sufficiently descriptive (Galobardes et al., 2007).

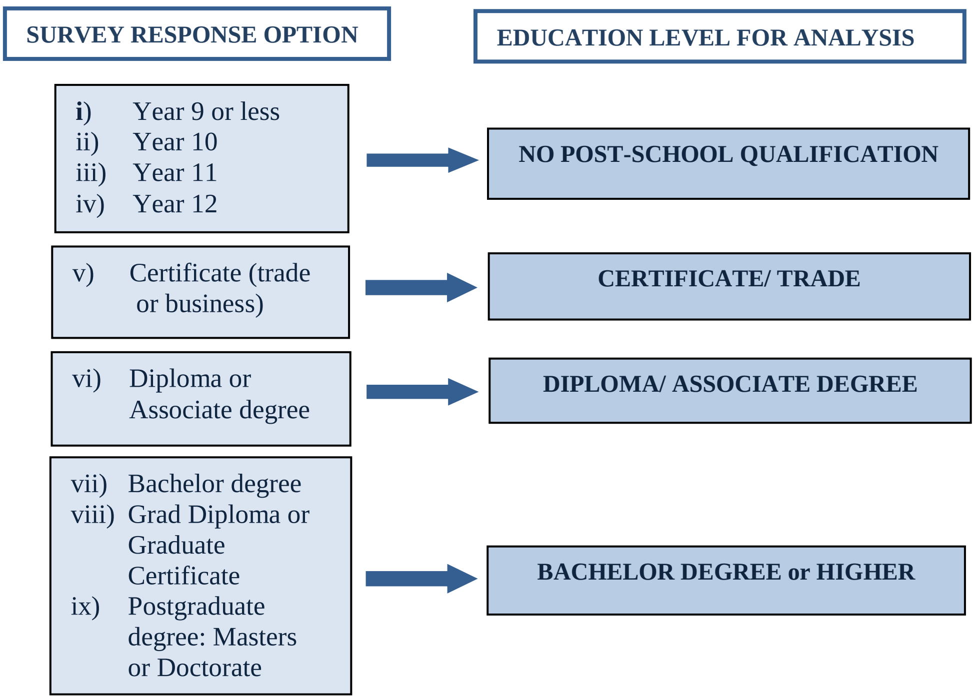
Occupation reflects social standing and access to privileges (Galobardes et al., 2007) and in this way may reflect prior education and subsequent knowledge. An individual's occupation may give insight into the resources available to them, their cultural experiences, and their health related behaviour (Johnson & Hall, 1988). Occupational information contributes to data comprehensiveness and greater description of the outcome variables. Respondents who are disinclined to provide income data because of the sensitive nature of this information (Dutton et al., 2005) may be more inclined to provide educational or occupational data. Income is directly related to health access and material resources that can influence health (Dutton et al., 2005) and health knowledge (Beier, & Ackerman, 2003).

A limitation of the above measurement set however is the absence of a life course measurement. There is strong evidence that disadvantaged socioeconomic conditions (Davey Smith & Lynch, 2004: Moody-Ayers, Lindquist, Sen & Covinsky, 2007) and their duration (Power, Manor & Matthews, 1999) over the life course affect health, self-reported physical function, all-cause mortality (Turrell, Lynch. Leite, Raghunathan & Kaplan, 2007), and cognitive function in adult life (Kaplan et al., 2001; Turrell et al., 2002).

Education Level

The item measuring education level is structured similarly to that used by Burton et al. (2003) and defines this indicator as the highest attained completed qualification after school. Participants were asked to tick one of the 10 options ranging from the lowest level Year 9 or less, to the highest level of Postgraduate Masters or Doctorate (Appendix A, Q. 3.8). As executed in the HABITAT study (Turrell et al., 2010), categorical variables were prepared for analysis by collapsing the 10 questionnaire options into 4 larger categories as depicted in Figure 3.7. Responses in the option labelled 'Other' (respondents were asked to describe their qualification) were re-directed by the candidate into the most appropriate of the other nine categories.

Figure 3.7 Collapse of educational responses into categorical variable levels

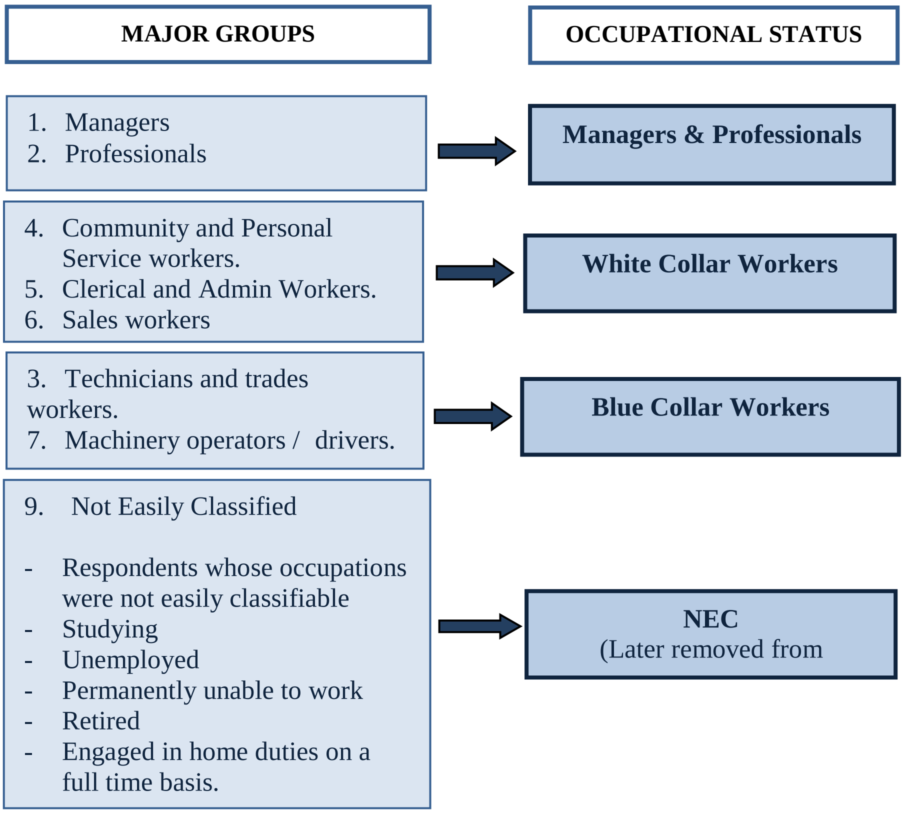


Current Occupation

In the current study, occupational information was classified into the eight major groups of occupational categories as defined by the Australian and New Zealand Standard of Occupational Classifications - ANZSCO (Australian Bureau of

Statistics/ Statistics New Zealand, 2009). For analysis as a categorical variable the 8 major groups were collapsed into 4 larger categories as depicted in Figure 3.8.

Figure 3.8 Collapse of major occupational groups into categorical variables



Sociodemographic characteristics of the Not Easily Classified (NEC) occupational group

Respondents whose occupation fell into the category of 'Not Easily Classified' (NEC) numbered 139 and comprised 16.8 % of the total sample aware of the *Measure Up* campaign. Characteristics of this group as self-reported in the study questionnaire are depicted in Figure 3.8. Description of this group was assisted by the responses to the questionnaire item number 3.9 (see Appendix A) regarding respondents' current employment status. In this item respondents were asked to indicate their current employment status including full time, part time, casual, work without pay, home duties, unemployed, retired, permanently unable to work, studying or other. Current employment or labour force status is a socioeconomic attribute best used to qualify other information such as income (Dutton, Turrell, &

Oldenburg, 2005). In the process of collapsing respondent occupational groups for analysis, this variable was used to determine members of the Not Easily Classifiable group.

Table 3.5 presents bivariate analyses describing respondents constituting this group. There are significant associations between education, income, age, and gender, and being classified as NEC. For example, in the association between education and NEC, 47.5% did not have post school qualifications and 24.5% had a bachelor degree or higher. So lower educated respondents were more likely to be classified as NEC. The group was considerably mixed and heterogeneous, and did not convincingly share common characteristics. It was decided by the research team to exclude the NEC group from analyses involving Occupation and thus this socioeconomic indicator was composed of three levels; Managers / Professionals, White collar and Blue collar workers.

Table 3.5 Relationships between respondents' education and income and membership of the occupational group 'Not Easily Classified'

Not Easily Classified (n = 139, 16.8%[1])	n	%
Education		
Bachelor degree or higher	34	24.5
Diploma / Associate degree	16	11.5
Certificate / Trade	23	16.5
No post school qualifications	66	**47.5*** **
Income		
Middle	21	20.2
High	12	11.5
Low-middle	36	34.6
Low	35	**33.7*** **
Age		
45-50 years	36	25.5
51-55 years	28	19.9
56-60 years	77	**54.6*** **
Gender		
Female	87	**61.7*** **
Male	54	38.3

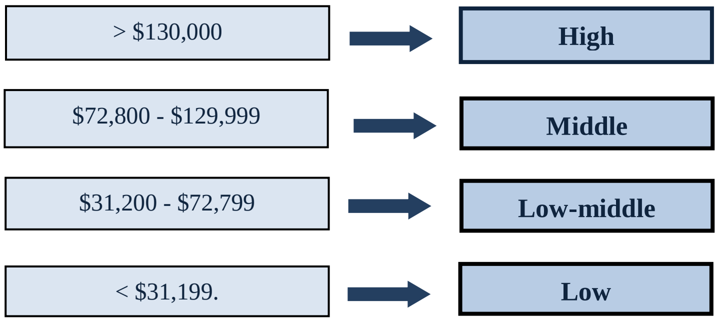
[1] % of analytical sample (n = 845)

*** p. < 0.001

Yearly Household Income

Income was measured by an estimate of total household pre-tax yearly income (Dutton et al, 2005). Respondents could choose to identify this amount by the yearly, fortnightly or weekly income. Thirteen categories of income ranged from < $300 to $2,500 or more per week. 'Don't know' and 'Don't wish to answer' responses were treated as missing data. Income groups were collapsed into 4 levels (Figure 3.9).

Figure 3.9 Yearly household income collapsed to 4 income level categories



3.6.3.2 MEASUREMENT OF THE CO-VARIATES AGE AND GENDER

Age and gender relationships are not the focus of this research thesis, but they have been found to have significant effects regarding health information. Older age has been associated with low health literacy (Paasche-Orlow et al., 2005), non-seeking of health information related to cancer (Ramanadhan & Viswanath, 2006; Czaja et al. 2003) and access to online health information (Berry et al., 2009; Ybarra & Suman, 2008). Conversely, age and gender have been associated with needing health information. Deeks, Lombard, Michelmore, and Teede, (2009) found that women and persons over the age of 51 years wanted information regarding illness prevention more than men or participants aged less than 30 years. Hence data on these two variables were collected and adjusted for in all multivariable analyses.

The age range selected for the study, 45-60 years, was determined by the secondary target population of the *Measure Up* campaign (Australian Better Health Initiative, 2006a). To collect age data, respondents entered their year of birth and this was operationalised into three categories, 45-50, 51-55, and 56-60 years, for analysis. Respondents indicated whether they were male or female and data were analysed in these two categories.

3.6.3.3 ANALYSIS OF THE INDEPENDENT VARIABLES AND CO-VARIATES

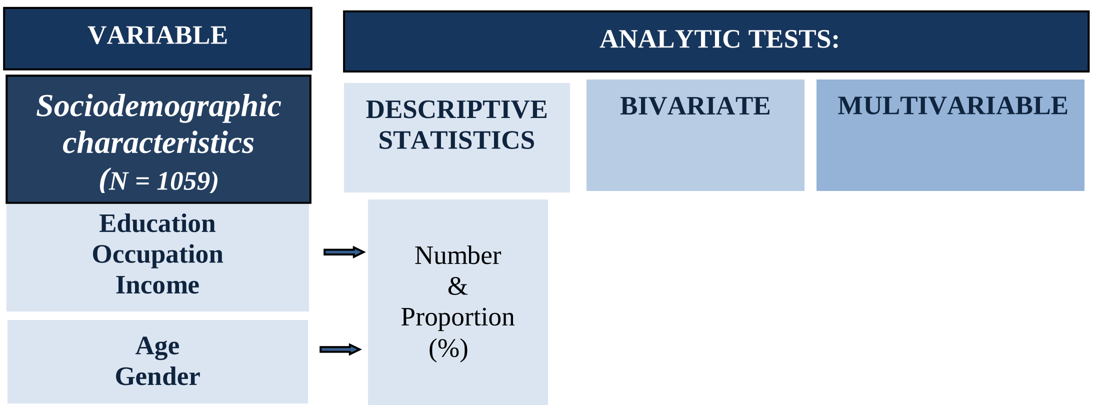
Sociodemographic characteristics

Education level, occupational status and yearly household income were used in bivariate and multivariable analyses across the study to explore differences in reach, understanding, and effectiveness by SEP. All multivariable analyses were adjusted for age and gender.

Age and Gender

Age and Gender were analysed as categorical variables using cross-tabulations and Chi square analyses to explore relationships between these variables and campaign awareness; media channel exposure; knowledge about terminology regarding Cancer, Lifestyle Related Chronic Disease, Type 2 Diabetes, Heart Disease; not having access to a computer; and having computer access but not going online. Bivariate tables are located in Appendix F. Figure 3.10 depicts on the left the independent (explanatory) variables, Education, Occupation, and Income, and the co-variates Age and Gender. In the centre is depicted the level and type of analysis.

Figure 3.10 Analytic diagram: Independent variables and Co-variates



3.6.3.4 MEASUREMENT AND ANALYSIS OF THE MAIN DEPENDENT (OUTCOME) VARIABLES

In the following sections I have presented the results of many analyses all performed simultaneously. It is proffered in the literature that when there are multiple comparisons performed, the likelihood of finding significant relationships between the variables (thus mistakenly rejecting the null hypothesis) is increased. As such there is a risk of the statistical significance being due to chance alone (Rothman, 1990). It is argued that adjustment for this potential overestimation of relationships by multi-inference procedures is not necessary in many situations, may be wasteful of information (Rothman & Greenland, 1998. p 228), and may limit cues or leads to further exploration (Rothman, 1990). In this study, for example, one of the interests is in specific or one by one relationships between education or occupation or income, and being prompted to engage in each specific behaviour. I have chosen a commonly acceptable presentation of single inference procedures, that is, the inclusion of confidence intervals for all analyses (Rothman & Greenland, 1998, p 229). Furthermore I have provided detailed information on all of the associations computed from the data (Greenland, 2008) in order to promote maximum transparency.

3.6.3.4.1 MEASURES TO ADDRESS RESEARCH QUESTION 1: *What is the relationship between socioeconomic position and Reach in mass media health promotion campaigns?*

REACH: Campaign awareness

Campaign reach was determined by participant awareness of the campaign and secondly by media channel exposure. Participants were asked in the questionnaire, *"Have you seen or heard any ads from the Measure Up campaign? These ads would be similar to the picture below"*. Respondents ticked a box to indicate 'Yes' they were aware or 'No' they were not aware of the Measure Up campaign. Frequency distribution of responses are in Table 3.6.

Table 3.6 Distribution of respondent awareness of the *Measure Up* campaign

Response	Total Sample (N=1059)	
	N	%
Yes	909	85.8
No	150	14.2

REACH: Media channel exposure

Reach was further explored by determining respondents' exposure to campaign advertising. Respondents were asked to identify from a list of media channels where they saw or heard *Measure Up* campaign advertising. Types included TV, radio, posters at a bus shelter, posters in a shopping centre or on a supermarket shopping trolley, and advertisements in newspapers and magazines. Also included is the option to choose "*I can't remember where but I have seen it"*. Respondents were asked to tick the 'Yes' or 'No' box for each media type and each was treated as a separate variable for analysis. Table 3.7 presents the proportion of respondents (excluding 139 unaware of the campaign) who were exposed to campaign information by the various media (N= 845).

Table 3.7 Distribution of respondents' exposure to the *Measure Up* campaign by media channel

Media Channel[1]	Sample	Exposure by Media Channel	
	N[2]	n	%
TV	842	791	93.9
Radio	841	73	8.7
Bus shelter	842	127	15.1
Shopping centre	842	130	15.4
Newspapers & Magazines	842	289	34.3
Shopping trolley	842	26	3.1
Saw but Forgot	842	13	1.5

[1] Respondents were able to indicate more than one type of exposure.
[2] 3-4 respondents indicated awareness but did not answer the question regarding the media channel/s.

REACH: The Media Channel Exposure Index (MCEI)

To determine effects of participant exposure to campaign information via multiple media channels a Media Channel Exposure Index (MCEI) was created. The MCEI is a cumulative index reflecting the total number of media types by which each respondent was exposed to *Measure Up* campaign advertising. All of the 'Yes' boxes ticked by the respondent were summed to form a single index number (the MCEI) and treated as a continuous variable. Hence, the higher the index number, the more channels the respondent was exposed to. This method has been used in other studies

(Turrell & Kavanagh, 2006; Wilkinson, Vasudevan, Honn, Spitz, & Chamberlain, 2009). The distribution of MCEI scores amongst respondents is presented in Table 3.8. Over half (56.4%) of respondents saw or heard of the *Measure Up* campaign by way of one media channel only.

Table 3.8 Distribution of Media Channel Exposure Index (MCEI) scores

MCEI	n	Percentage of Respondents
0	3[1]	0.4
1	474	56.1
2	216	25.6
3	93	11.0
4	38	4.5
5	14	1.7
6	7	0.8
Total	845	100

[1] Three respondents indicated awareness but did not answer the question regarding media channel/s.

3.6.3.4.2 ANALYSIS OF DATA FOR RESEARCH QUESTION 1: *What is the relationship between SEP and Reach in mass media health promotion campaigns?*

Campaign Awareness

Awareness was analysed as a dichotomous variable comprised of 'Yes' they were aware or 'No' they were not aware of the *Measure Up* campaign (Table 3.3). Cross-tabulations and Chi-square tests were used to explore relationships between awareness and SEP (Table 4.1), age and gender as presented in Table F1 (Appendix F). Multivariable Logistic Regression was used to explore the likelihood of respondents from each socioeconomic group being aware of the campaign after adjusting for age and gender.

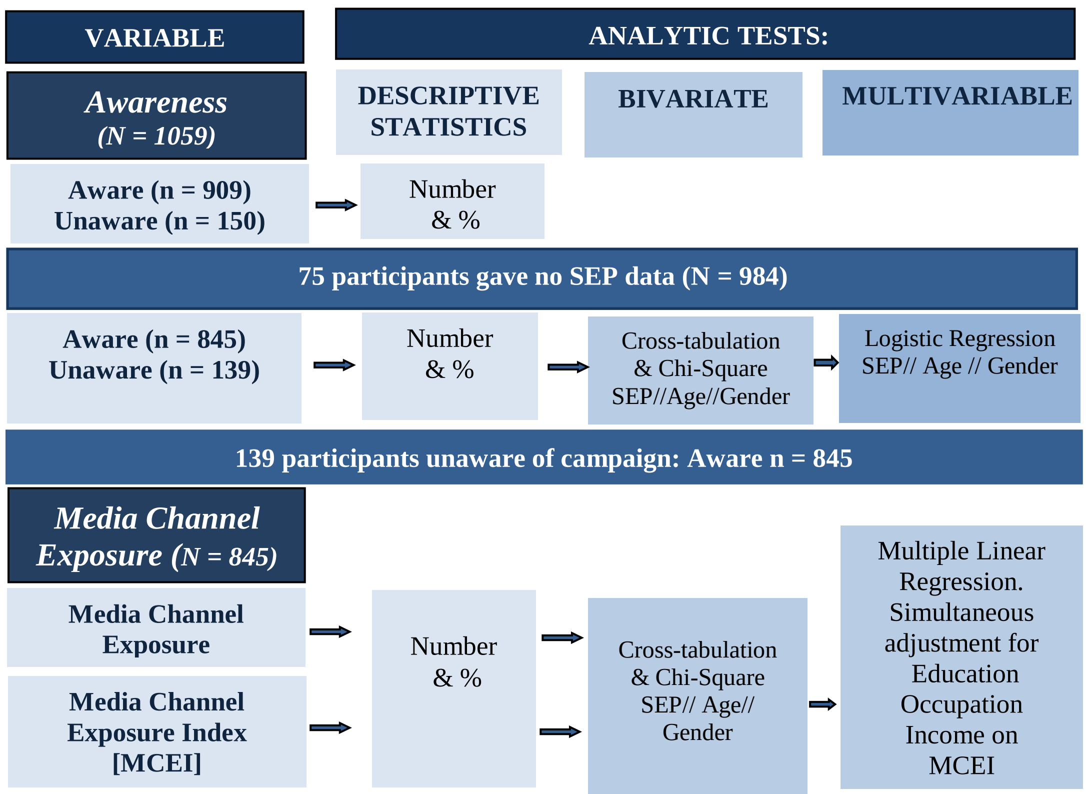
Media Channel Exposure

For the first stage, bivariate analyses were used to explore relationships between media channel exposure and SEP (Table 4.2), as well as age and gender (Table F2, Appendix F). For the second stage, Multivariable Logistic Regression was used to explore the likelihood of respondents from each socioeconomic group being exposed to campaign information via each media channel after adjusting for age and gender.

For the final stage, relationships between SEP and the total number of media channels by which participants were exposed to *Measure Up* campaign information was explored using Multiple Linear Regression analysis (background information is presented in Appendix G). The outcome variable is a media channel exposure index (MCEI) that ranged from 0–6, with the higher scores indicating exposure to more media channels. Four age and gender adjusted models were compared, Model 1 represents education level adjusted for age and gender, Model 2 represents occupation adjusted for age and gender, Model 3 represents income adjusted for age and gender, and Model 4 represents the simultaneous adjustment by all socioeconomic measures and age and gender to account for confounding from other socioeconomic indicators.

In the analytical diagram (Figure 3.11) the dependent variables campaign Awareness, and Media Channel Exposure are depicted on the left. On the right are the descriptive statistics, bivariate, and multivariable tests employed to analyse relationships between the dependent variables depicted in this diagram, and the independent variables. As explained in Figure 3.3, the sample size differs across analyses.

Figure 3.11 Analytic diagram: Research Question 1



3.6.3.4.3. MEASURES TO ADDRESS RESEARCH QUESTION 2: *What is the relationship between socioeconomic position and understanding of mass media health promotion campaign messages and language?*

UNDERSTANDING: Knowledge

Measurement of individual knowledge

Participant understanding of campaign language is explored by asking about terminology/ language used in the advertisements and for information from the *Measure Up* campaign. Figure 3.12 depicts on the left, the major lifestyle related chronic diseases risk factors (CDRF) that are strongly related to weight gain and featured in the *Measure Up* campaign. These CDRFs are addressed by five subscales and include:

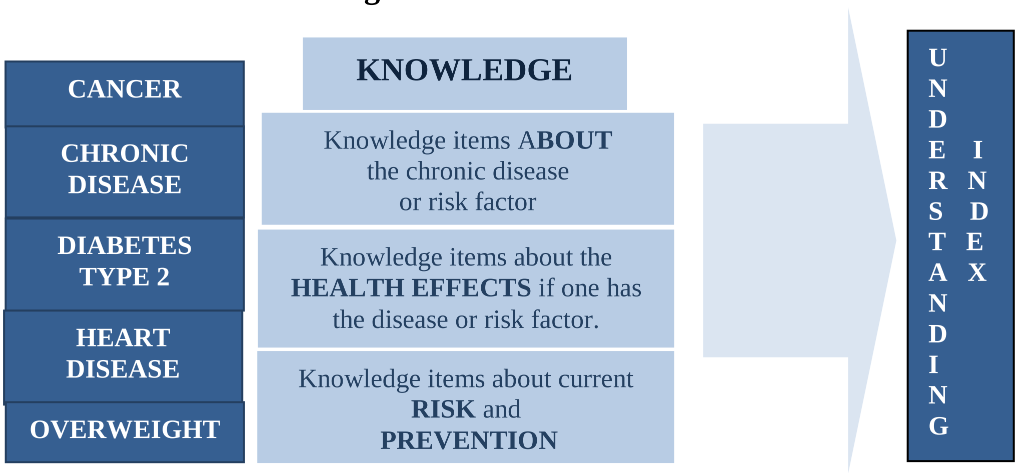
Cancer (5 items)
Chronic Disease (10 items)
Type 2 Diabetes (14 items)
Heart Disease (9 items)
Overweight (11 items)

The number of items in each CDRF subscale varies, and thus for ease of presentation and later discussion, the items were grouped conceptually into:

Knowledge about CDRF
Knowledge about health effects if one has CDRF
Knowledge about current risk and prevention of CDRF (Figure 3.12).

Numbers of correctly answered items were summed to form the Understanding index depicted on the right of Figure 3.12.

Figure 3.12 Model depicting knowledge components comprising the Understanding Index



For analysis by Logistic Regression, outcome variables with the three option response format of *Agree / Disagree /Don't know* were re-coded into a 2 option response variable. Both 'incorrect' responses and 'Don't know' responses became one group because in both cases the respondent did not possess the knowledge. The second group was comprised of respondents who gave correct answers. This method has been used previously in research requiring the creation of indices for dietary knowledge (Turrell & Kavanagh, 2006), and knowledge about cancer (Wilkinson et al, 2009).

Measurement of Understanding Indices for Chronic Disease Risk Factor Categories

It is posited that the knowledge items collectively constitute an understanding, based on *Bloom's (revised) Hierarchical Model* of the thinking and learning process (Krathwohl, 2002) (Figure 2.3). In this model, 'understanding' is based on 'knowledge' and involves 'Constructing meaning from oral, written and graphic messages by interpreting, exemplifying, classifying, summarizing, inferring, comparing and explaining' (Anderson et al., 2001, p 67). Thus for the purpose of this study, the understanding index is an indication of respondents' understanding of the language used by health professionals about these conditions in health promotion materials and on health information websites.

The Understanding Indices were thus grouped similarly to that described in previous research (Turrell & Kavanagh, 2006; Wilkinson, 2009). The above coding was reversed ('correct' assigned a code of 1 or 'incorrect' assigned code 0), and respondent's correct knowledge scores in each CDRF category were summed to form the index for that CDRF category. Hence, the higher the index number the greater the respondent's understanding of the relative CDRF terminology. Measurement details for knowledge items and understanding indices for each CDRF follow.

KNOWLEDGE ABOUT CANCER

Participant knowledge about cancer was examined using 5 items that addressed general knowledge about the disease, what were the health effects if you have cancer, and current risk and prevention (Table 3.9). Only a small proportion of respondents (1.1% to 7.6%) gave incorrect answers.

Table 3.9 Proportion of respondents[1] who incorrectly answered each knowledge item about Cancer

Do you agree or disagree with the following statements about Cancer?[2]	**Sample**	**Incorrect**	
	N[3]	n	%
Knowledge about the condition			
Cancer is an illness than can occur at any age	836	9	1.1
Cancer is an illness in which abnormal cells multiply and are able to invade other cells	834	63	7.6
Cancer is an illness that always forms a lump so you know when you have it.	836	63	7.5
Knowledge about health effects			
Cancer is an illness that is a major cause of death in the Australian population.	836	118	14.1
Knowledge about current risk and prevention			
Cancer is an illness in which some cases can be prevented by keeping a healthy weight, being physically active and eating a healthy diet.	836	323	38.6

[1] Total sample (N = 845) includes only those respondents aware of the *Measure Up* campaign and provided at least one item of socioeconomic data.
[2] Source of items and supporting references are located in Appendix B.
[3] N = number of respondents who answered the question.

Distribution of the Index measuring Understanding of Cancer

The Understanding Index for Cancer is comprised of 5 knowledge items for which the response options were 'agree', 'disagree', or 'don't know'. Possible scores ranged from 0-5 with higher scores denoting higher levels of understanding about Cancer. Over 85% of the sample scored 4-5, and 14.9% scored 0-3 (Table 3.10).

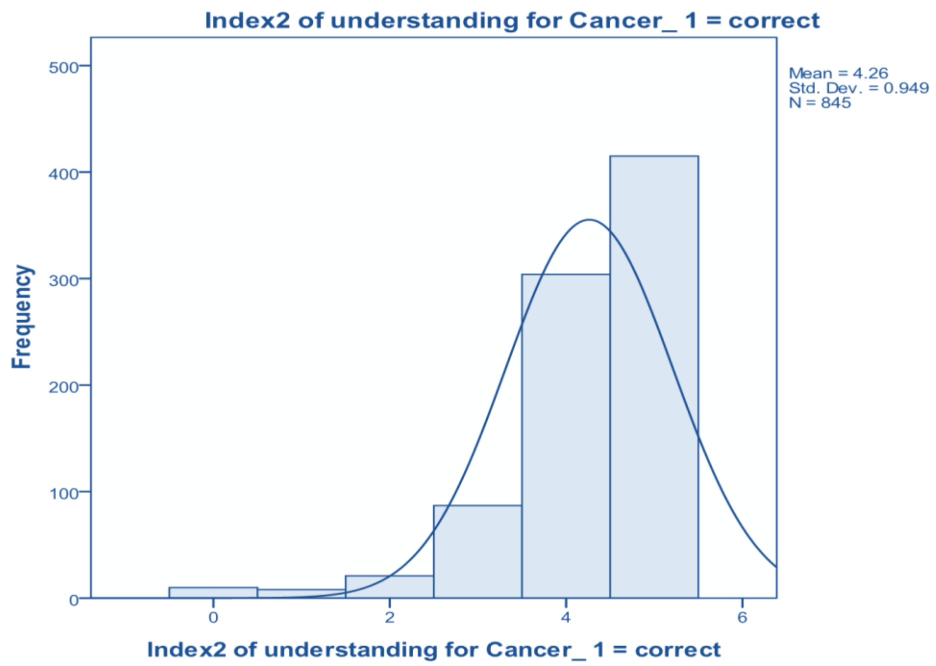
Table 3.10 Distribution of Understanding Index scores[1] for Cancer

Total score	Frequency	Percent	Valid Percent	Cumulative Percent
0	10	1.2	1.2	1.2
1	8	0.9	0.9	2.1
2	21	2.5	2.5	4.6
3	87	10.3	10.3	14.9
4	304	36.0	36.0	50.9
5	415	49.1	49.1	100.0
Total	845	100.0	100.0	

[1] Highest possible score = 5

The histogram depicting distribution of Understanding Indices for Cancer is presented in Figure 3.13.

Figure 3.13 Understanding Index for Cancer: Histogram with normal distribution curve



KNOWLEDGE ABOUT LIFESTYLE RELATED CHRONIC DISEASE

This CDRF section was addressed in the study survey by 10 items (Table 3.11). Proportions of respondents' incorrect answers ranged between 6.9% and 41.3%. Three items regarding prevention of LRCD (concerning physical activity, fruit and vegetable consumption, and drinking water) were answered incorrectly by large proportions of respondents, 35%, 40.2% and 41.3% respectively.

Table 3.11 Proportion of respondents[1] who incorrectly answered each knowledge item about Lifestyle Related Chronic Disease

Do you agree with the following statements about lifestyle related chronic disease?[2]	**Total**	**Incorrect**	
	N[3]	n	%
Knowledge about the condition			
Lifestyle related chronic diseases can last more than 6 months and keep coming back.	835	198	23.7
Lifestyle related chronic diseases only occur in the elderly.	835	58	6.9
Lifestyle related chronic diseases can be quickly cured with medication.	833	169	20.3
Lifestyle related chronic disease is too late to do anything about.	835	101	12.1
Knowledge about health effects			
Lifestyle related chronic diseases can result in pain, disability or death.	834	77	9.2
Knowledge about current risk and prevention			
Lifestyle related chronic diseases can be prevented by regular physical activity.	832	291	35.0
My risk of lifestyle related chronic disease would be increased if my waist measurement was greater than 94 cm (males) or 80cm (females).	839	93	11.1
My risk of lifestyle related chronic disease would be decreased if I was physically active for more than 30 minutes each day.	839	78	9.3
My risk of lifestyle related chronic disease would be increased if I regularly ate less than 2 serves of fruit and 5 vegetables each day.	839	337	40.2
My risk of lifestyle related chronic disease would be decreased if I drank mainly water throughout the day.	837	346	41.3

[1] Total sample N = 845 includes only those aware of the *Measure Up* campaign & gave ≥ one item of SEP data.
[2] Source of items and supporting references are located in Appendix B.
[3] N = Number of respondents answering the question.

Distribution of Understanding Index scores: Lifestyle Related Chronic Disease

The Understanding Index for LRCD is comprised of 10 knowledge items. Response options included ‘agree’, ‘disagree’, or ‘don’t know’. Scores range from 0-10 (Table 3.12) with higher scores denoting higher levels of understanding. Sixty seven percent (67%) of the population scored 8-10, 30% scored 0-7.

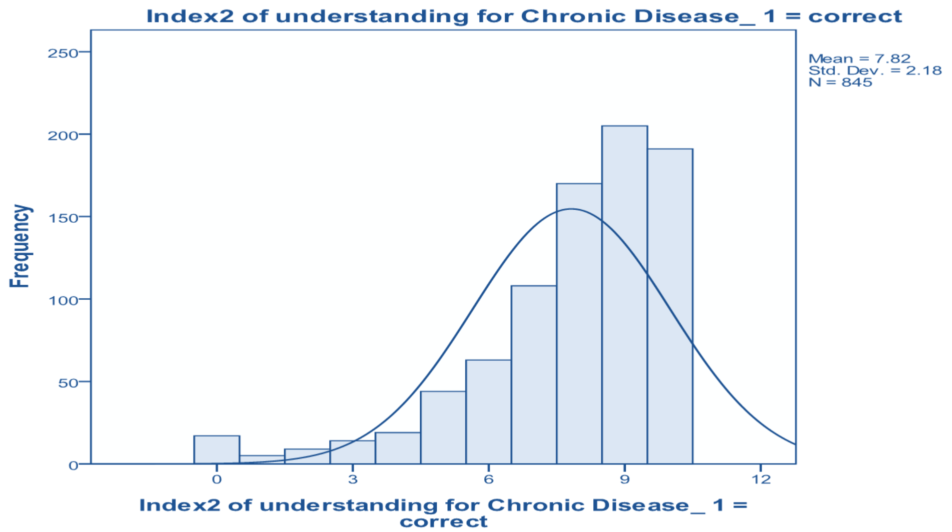
Table 3.12 Distribution of Understanding Index scores[1] for Lifestyle Related Chronic Disease

Index for LRCD	Number attaining score	Valid %	Cumulative %
0	17	2.0	2.0
1	5	0.6	2.6
2	9	1.1	3.7
3	14	1.7	5.3
4	19	2.2	7.6
5	44	5.2	12.8
6	63	7.5	20.2
7	108	12.8	33.0
8	170	20.1	53.1
9	205	24.3	77.4
10	191	22.6	100.0
Total	845	100.0	100.0

[1] Highest possible score = 10

The histogram depicting distribution of Understanding Indices for Lifestyle Related Chronic Disease is presented in Figure 3.14.

Figure 3.14 Understanding Index for Lifestyle Related Chronic Disease: Histogram with normal distribution curve



KNOWLEDGE ABOUT TYPE 2 DIABETES

Type 2 Diabetes (T2D) is addressed by 14 survey items (Table 3.13) in which there were moderate proportions of incorrect answers across 13 of the items. Large proportions (34.6% and 71.5%) of respondents incorrectly answered two items regarding sugar in the blood. As well, for five of seven items over a third of respondents were unaware of the health effects if one has diabetes. Prevention of T2D with lifestyle choices was answered incorrectly by 16.8% of respondents.

Table 3.13 Proportion of respondents1 who incorrectly answered each knowledge item about Type 2 Diabetes

Do you agree or disagree with the following statements about Type 2 diabetes?	N[3]	Incorrect n	Incorrect %
Knowledge about the condition			
People who have excess weight around their waistline are at higher risk for diabetes.	836	119	14.2
Type 2 diabetes is a condition that causes there to be too much sugar in the blood.	833	288	34.6
Type 2 diabetes is a condition in which the body does not produce enough insulin or the insulin does not work properly.	833	198	23.8
Type 2 diabetes is a condition that is easily treated by simply not eating sugar.	831	209	25.2
Type 2 diabetes is a condition that only affects elderly people.	832	70	8.4
Type 2 diabetes is a condition in which glucose cannot get from the bloodstream into the body cells.	824	589	71.5
Knowledge about health effects			
If a person has diabetes they are much more likely to experience heart attack.	834	315	37.8
If a person has diabetes they are much more likely to experience skin cancer.	829	326	39.3
If a person has diabetes they are much more likely to experience blindness.	833	194	23.3
If a person has diabetes they are much more likely to experience stroke.	830	305	36.7
If a person has diabetes they are much more likely to experience kidney problems.	831	300	36.1
If a person has diabetes they are much more likely to experience loss of a limb.	835	204	24.4
If a person has diabetes they are much more likely to experience impotence.	828	515	62.2
Knowledge about current risk and prevention			
Type 2 diabetes is a condition that is preventable by keeping a healthy weight, taking daily physical activity and making good food choices.	833	140	16.8

[1] Total sample N = 845 includes only those respondents who are aware of the campaign and who provided at least one item of socioeconomic data.
[2] Source of items and supporting references are located in Appendix B.
[3] N= number of respondents who answered the question.

Distribution of the Understanding Index scores: Type 2 Diabetes

The Understanding Index for T2D is comprised of 14 knowledge items. Response options included ‘agree’, ‘disagree’, or ‘don’t know’. Scores range from 0-14 with higher scores denoting higher levels of understanding. Scores ranged widely. Over 57.8% attained an above average (9.31) index (Table 3.14).

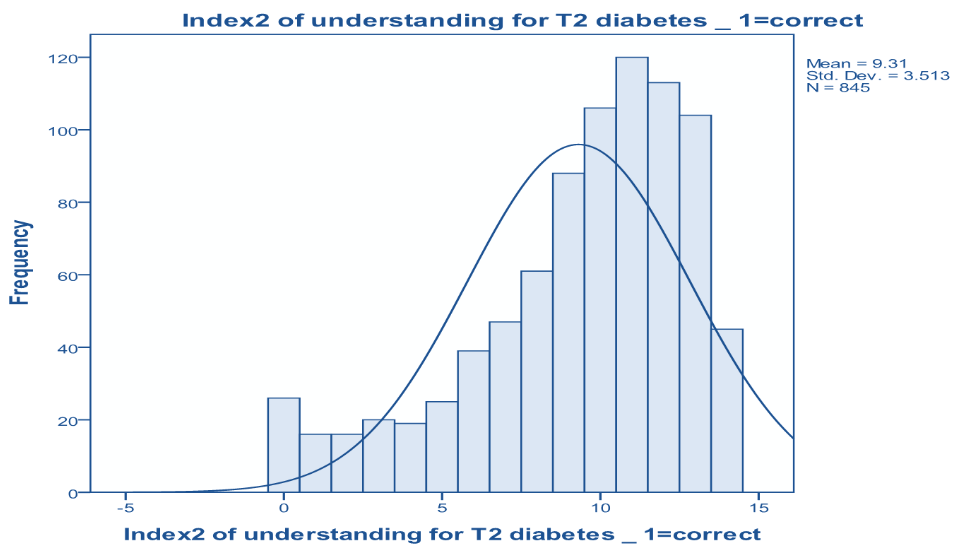
Table 3.14 Distribution of Understanding Index scores[1] for Type 2 Diabetes

Understanding Index T2D	Number attaining score	Percent	Cumulative %
0	26	3.1	3.1
1	16	1.9	5.0
2	16	1.9	6.9
3	20	2.4	9.2
4	19	2.2	11.5
5	25	3.0	14.4
6	39	4.6	19.1
7	47	5.6	24.6
8	61	7.2	31.8
9	88	10.4	42.2
10	106	12.5	54.8
11	120	14.2	69.0
12	113	13.4	82.4
13	104	12.3	94.7
14	45	5.3	100.0
Total	845	100.0	

[1] Highest possible score = 14

The histogram depicting distribution of Understanding Indices for Type 2 Diabetes is presented in Figure 3.15.

Figure 3.15 Understanding Index for Type 2 Diabetes: Histogram and curve



KNOWLEDGE ABOUT HEART DISEASE

Knowledge about Heart Disease, risk, and prevention is addressed by 9 survey items (Table 3.15). Proportions of incorrect answers across items ranged from 8% to 55.2%. Almost 32% of respondents incorrectly answered the item regarding part of the heart muscle dying in a heart attack. For the item regarding risk if there was parental history of heart attack, over 25% of the sample responded incorrectly, and 16.7% responded incorrectly regarding prevention by healthy lifestyle choices.

Table 3.15 Proportion of respondents who incorrectly answered each knowledge item about Heart Disease

Knowledge Item[2]	Total N[3]	Incorrect n	Incorrect %
Knowledge about the condition			
Heart disease is also known as coronary heart disease or coronary artery disease.	835	105	12.6
Heart disease is a condition in which blood vessels to the lungs become blocked making it hard to breathe.	831	412	49.6
Heart disease develops over time with gradual blocking of one or more blood vessels that feed the heart muscle.	834	67	8.0
Heart disease may first show as heart pain or angina.	832	146	17.5
Heart attack is a severe form of heart disease in which part of the heart muscle dies.	831	265	31.9
Heart attack can be cured by medications that thin the blood.	831	459	55.2
Knowledge about health effects			
Heart attack can lead to long term disability or death.	836	53	6.3
Knowledge about current risk and prevention			
Heart attack is preventable by being physically active each day, making healthy food choices and keeping body weight down.	833	139	16.7
I would consider myself at risk for heart disease if one of my parents were to die of heart attack.	834	211	25.3

[1] Total sample N = 845 includes only those respondents who are aware of the campaign and provided socioeconomic data.
[2] Source of items and supporting references are located in Appendix B.
[3] N= Number of respondents who answered the question.

Distribution of the Understanding Index scores: Heart Disease

The Understanding Index for Heart Disease is comprised of 9 knowledge items. Response options included 'agree', 'disagree', or 'don't know'. Scores ranged from 0-9 (Table 3.16) with higher scores denoting higher levels of understanding about Heart Disease terminology. Scores ranged widely with mean of 6.67 (SD = 1.88).

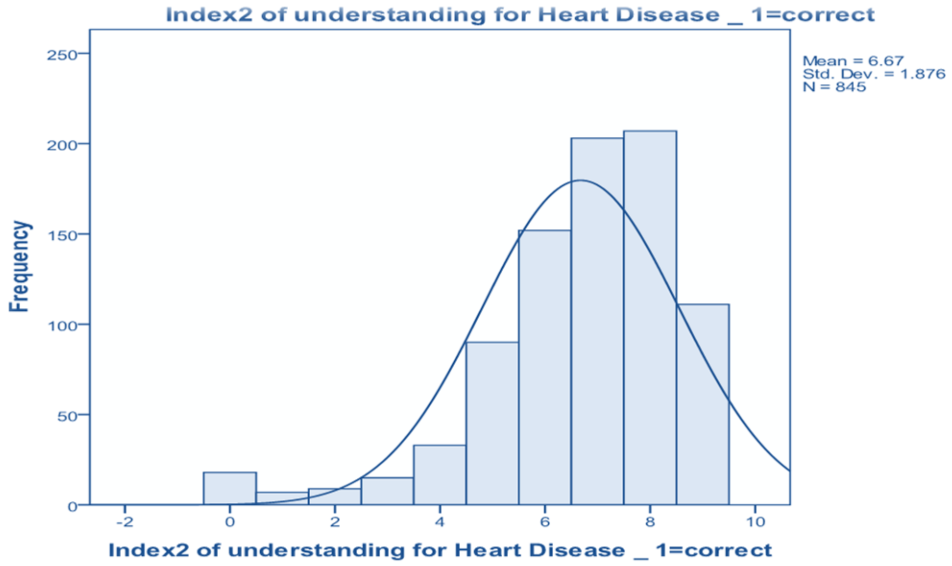
Table 3.16 Distribution of Understanding Index scores[1] for Heart Disease

Understanding Index Heart Disease	Number attaining Score	Percent	Cumulative %
0	18	2.1	2.1
1	7	.8	3.0
2	9	1.1	4.0
3	15	1.8	5.8
4	33	3.9	9.7
5	90	10.7	20.4
6	152	18.0	38.3
7	203	24.0	62.4
8	207	24.5	86.9
9	111	13.1	100.0
Total	845	100.0	

[1] Highest possible score = 9.

The histogram depicting distribution of Understanding Indices for Heart Disease is presented in Figure 3.16.

Figure 3.16 Understanding Index for Heart Disease: Histogram with normal distribution curve



KNOWLEDGE ABOUT OVERWEIGHT

Knowledge about overweight risk and prevention is addressed by 11 survey items (Table 3.17). Proportions of incorrect answers ranged widely across items from 4.5 to 78.9% with the higher proportions of incorrect answers given for items regarding cancers for which being overweight increases risk. The smallest proportions of incorrect answers were given for items regarding healthy behaviours that should be taken up if one has a large waistline.

Table 3.17 Proportion of respondents[1] who incorrectly answered each knowledge item about overweight

Knowledge Item	Total N[1]	Incorrect n	Incorrect %
Knowledge about current risk and prevention			
Being overweight increases risk of:- Skin cancer.	839	189	22.5
Breast cancer (post menopause).	839	613	73.1
Prostate cancer.	838	661	78.9
Leukaemia.	837	409	48.9
Bowel cancer.	838	501	59.8
Knowledge about the condition			
If you have a large waist line this may mean that:- You have too much fat inside your abdomen.	838	255	30.4
Over time, you have taken in more energy than you have burnt off leading to an energy imbalance.	838	142	16.9
Knowledge about health effects			
Fat coats your heart, kidneys, liver, and pancreas increasing your risk of serious illness.	839	186	22.2
Knowledge about current risk and prevention			
You should eat less snack and take away foods.	839	65	7.7
You should eat more vegetables, fruit and lean meat.	839	60	7.2
You should be moderately active for at least 30 minutes each day.	839	38	4.5

1 Total sample N = 845 includes only those respondents who are aware of the *Measure Up* campaign and provided at least one item of socioeconomic data.
2 Source of items and supporting references are located in Appendix B.
3 N = number of respondents who answered the question.

Distribution of the Understanding Index scores for Overweight

Table 3.18 indicates the 11 knowledge items comprising the Understanding Index for Overweight. Response options included ‘agree’, ‘disagree’, or ‘don’t know’. The possible score range was 0-11 with higher scores denoting higher understanding about overweight and obesity. Scores ranged widely with mean of 7.22 (SD = 2.14).

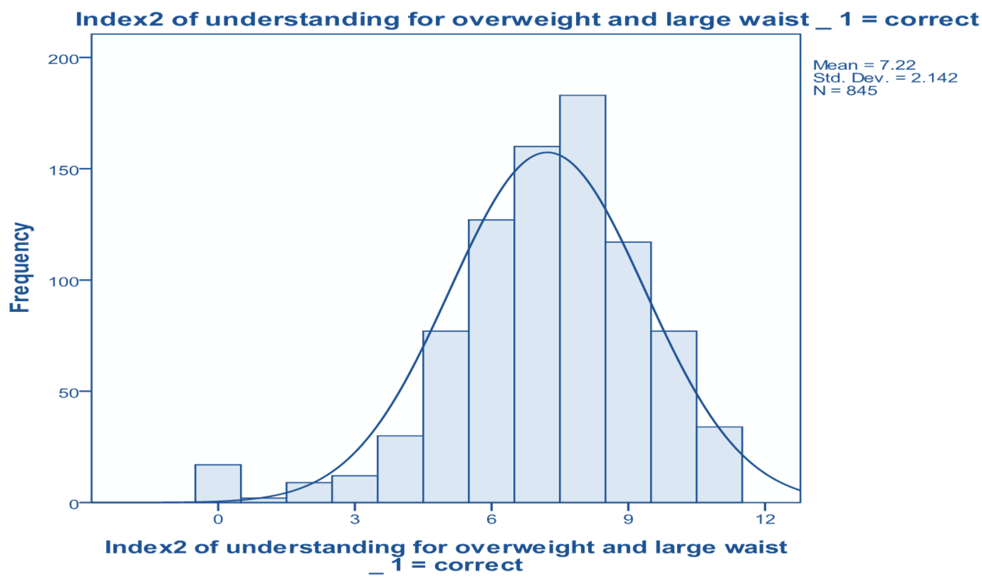
Table 3.18 Distribution of Understanding Index scores[1] for Overweight

Index for Overweight	Number attaining score	Percent	Cumulative Percent
0	17	2.0	2.0
1	2	.2	2.2
2	9	1.1	3.3
3	12	1.4	4.7
4	30	3.6	8.3
6	127	15.0	32.4
7	160	18.9	51.4
8	183	21.7	73.0
9	117	13.8	86.9
10	77	9.1	96.0
11	34	4.0	100.0
Total	845	100.0	

[1] Highest possible score = 11

The histogram depicting distribution of Understanding Indices for Overweight is presented in Figure 3.17.

Figure 3.17 Understanding Index for Overweight: Histogram with normal distribution curve



3.6.3.4.4 ANALYSIS OF DATA FOR RESEARCH QUESTION 2: *What is the relationship between socioeconomic position and understanding of mass media health promotion campaign messages and language?*

Analysis of the Knowledge items

Cross tabulations and Chi-square tests were used to explore relationships between SEP and proportions of **incorrect** answers for each knowledge item. Relationships between proportions of **incorrect** answers for each knowledge item, and age, and gender were examined similarly.

Responses to knowledge items were considered either correct or incorrect. Incorrect included 'Don't know' and incorrect responses, and are analysed so that the factor of interest, those who did not possess the knowledge (incorrect answers) are coded '1' and those who do possess the knowledge are coded '0'. Socioeconomic indicators were modelled separately to ascertain the unique contribution of each SEP indicator on respondents attaining an incorrect score. Each socioeconomic predictor, education, occupation, and income, adjusted for age and gender, were considered in separate Multivariable Logistic Regression models to determine the influence of each level of the predictor variable on respondents attaining an incorrect score. Results are presented in terms of odds ratios and 95% confidence intervals for each level of the predictor variables. The referent group in each analysis is that of the highest SEP: Bachelor or Higher Degree, Managers/ Professionals, and High income.

Analysis of the Chronic Disease/ Risk Factor Understanding Indices

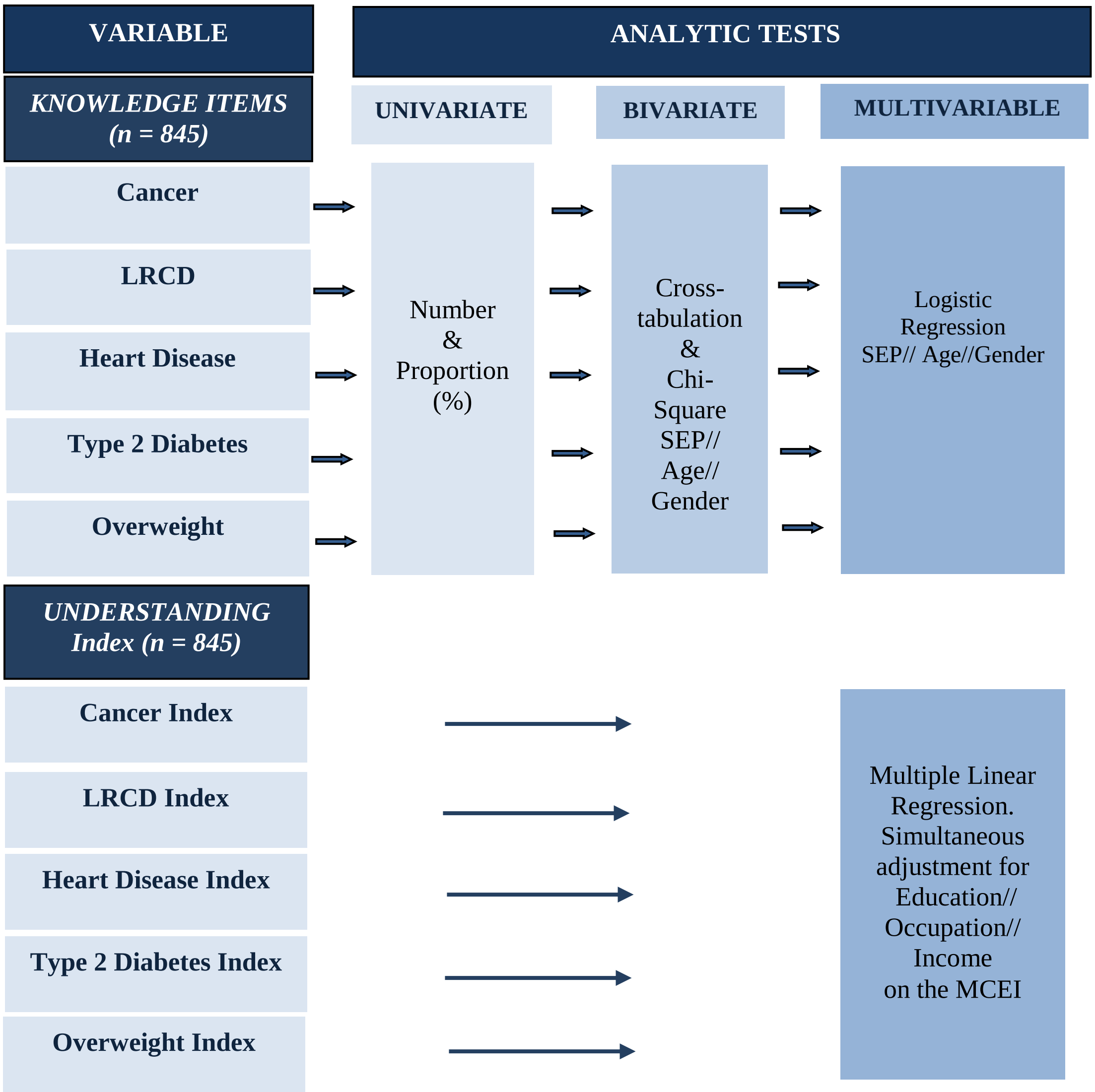
As previously discussed, indices were calculated by summing respondents' correct knowledge scores in each CDRF subscale. The higher the index number the greater the respondent's understanding of the relevant CDRF terminology. In the multivariable analyses each index was treated as a continuous variable (Research Methods Group, Statistics Clinic, personal communication, November 3, 2011). Using Multivariable Linear Regression, the means of indices are compared across socioeconomic levels in education, occupation, and income to determine which has the strongest association.

For each CDRF subscale (Cancer, Lifestyle Related Chronic Disease, Type 2 Diabetes, Heart Disease, and Overweight), four age and gender adjusted models were compared. Model 1 represents education level adjusted for age and gender; Model 2 represents occupation adjusted for age and gender; Model 3 represents income adjusted for age and gender; and Model 4 represents the simultaneous adjustment by all socioeconomic measures and age and gender to account for confounding from other socioeconomic indicators.

The Analytic Diagram for Research Question 2

Depicted in the left hand column of Figure 3.18 are the dependent variables representing the sets of knowledge items that comprise each Chronic Disease Risk Factor (CDRF) sub-scale. Below the knowledge items are variables representing the Understanding Index for each CDRF subscale. The Understanding Index represents individual's understanding of the CDRF terminology used in the *Measure Up* campaign. The remaining three columns depict analytic tests and independent variables included in the analysis.

Figure 3.18 Analytic diagram: Research Question 2



3.6.3.4.5. MEASURES TO ADDRESS RESEARCH QUESTION 3: *What is the relationship between socioeconomic position and effectiveness of mass media health promotion campaign messages in terms of proximal behaviour response?*

Respondents ticked 'Yes' or 'No' to indicate that the campaign did or did not prompt them to engage in proximal (early) healthy behaviour change. Behaviours included waist measurement, weight measurement, increasing physical activity, increasing fruit and vegetable consumption, and speaking to their doctor about prevention of chronic disease. Campaign effectiveness also included whether the campaign prompted respondents to go online to the *Measure Up* website, and the reason/s for doing so.

EFFECTIVENESS: Being prompted to engage in proximal healthy behaviours

Table 3.19 presents the distribution of participants' prompted or not by the campaign to engage in the listed behaviour. On the right is depicted numbers of respondents who wrote on the survey that they 'already do' engage in the behaviour. This response was interpreted as the respondent already performing this health behaviour and thus were not prompted by the campaign to do so. Most 'yes' responses were given for the behaviours, weight measurement, increasing physical activity, and increasing fruit and vegetable consumption.

Table 3.19 Proportion of respondents who were prompted to engage in proximal behaviours

Behaviour	% prompted to engage in behaviour						
	Total	Yes		No		Already do[3]	
	N[2]	n	%	n	%	n	%
The *Measure Up* campaign ads have prompted me to:-							
Measure my waist line	830	312	37.3	518	62.0	6	0.7
Weigh myself	832	428	51.0	404	48.1	8	1.0
Increase my physical activity	830	412	49.2	418	49.9	8	1.0
Increase my fruit and vegetable consumption	830	366	43.6	464	55.3	9	1.1
Talk to my doctor about preventing chronic disease	831	154	18.4	677	80.9	6	0.7

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign and 75 respondents who did not provide any SE information.
[2] Total number of respondents who answered each item.
[3] This category added retrospectively as a result of respondents' written comments.

EFFECTIVENESS: Being prompted to go online to the *Measure Up* website

Table 3.20 depicts the distribution of 'yes' responses to pursue further information on the *Measure Up* website. Only a minority of respondents did not have access to a computer (8.9%); many more had access (87.9%) but did not go online, and 26 respondents (3.2%) chose to pursue the online information.

Table 3.20 Distribution of responses to *Measure Up* prompt to go online for campaign information

Item	n[2]	%
Did the *Measure Up* campaign ads prompt you to go online to the *Measure Up* website?		
NO, I don't have access to a computer	73	8.9
NO, I have access to a computer but did not go online	720	87.9
YES, I went online to the *Measure Up* website	26	3.2

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign, 75 who did not provide any SE information, and 26 missing. Respondents answering this question n = 819.
[2] Total number of respondents who answered each option.

Reasons for pursuit of online information.

The vast majority of respondents did not go online. Table 3.21 presents reasons for which respondents pursued further information on the *Measure Up* website. Respondents were able to opt for more than one reason. The most frequently chosen was to find more information about preventing chronic disease. The least chosen reason was for information on how to get a tape measure and an information kit. Because of the small numbers pursuing online information, bivariate and multivariable analyses were not performed.

Table 3.21 Reasons for going online to the *Measure Up* campaign website: distribution of responses

Item	n[2]	%
I went online to the *Measure Up* website to:		
Find more information about what chronic disease is	13	1.6
To find information about healthy eating and healthy recipes	16	1.9
Send away for the tape measure and information kit	7	0.9
Find information about becoming more physically active	12	1.5
Find information about losing weight	11	1.3
Find more information about preventing chronic disease	19	2.3

[1] Total population = 845. Excludes 75 respondents who did not provide any SE information, and 139 respondents who were unaware of the *Measure Up* campaign. Missing data = 22.
[2] Total number of respondents who went online = 26.

3.6.3.4.5. ANALYSIS OF DATA FOR RESEARCH QUESTION 3: *What is the relationship between SEP and effectiveness of mass media health promotion campaign messages in terms of proximal behaviour response?*

Being prompted by the *Measure Up* campaign to engage in proximal behaviours

Cross-tabulations and Chi square tests explored relationships between SEP and being prompted by the *Measure Up* campaign to engage in proximal healthy behaviours. Similarly analysed were relationships between age and gender and being prompted to engage (Appendix Table F8). Multivariable Logistic regression analysis explored the age and gender adjusted odds of respondents from each socioeconomic group being prompted to engage in each behaviour.

Being prompted to go online to the *Measure Up* website

Pursuit of online information was considered conceptually as a proximal behaviour but analysed separately because the response would be affected by each individual's access to a computer. This influence is accounted for by a 'computer access response variable (Table 3.20). The respondent groups for analysis included those who did not have access to a computer, those who did have access to a computer but did not go online and those who did go on line to the *Measure Up* website.

Did or did not have computer access

Firstly, the number and percentage of respondents who did or did not have computer access were calculated. Following this, cross-tabulation and Chi square analyses were performed to determine differences by age and gender (Appendix F9), and SEP.

Did have computer access

The group who did have access to a computer were further defined by whether or not they went online to pursue further information from the *Measure Up* website.

Did have computer access and went online to Measure Up website

In the respondents who went online, reasons for doing so were examined. Number and percentage were obtained for each reason.

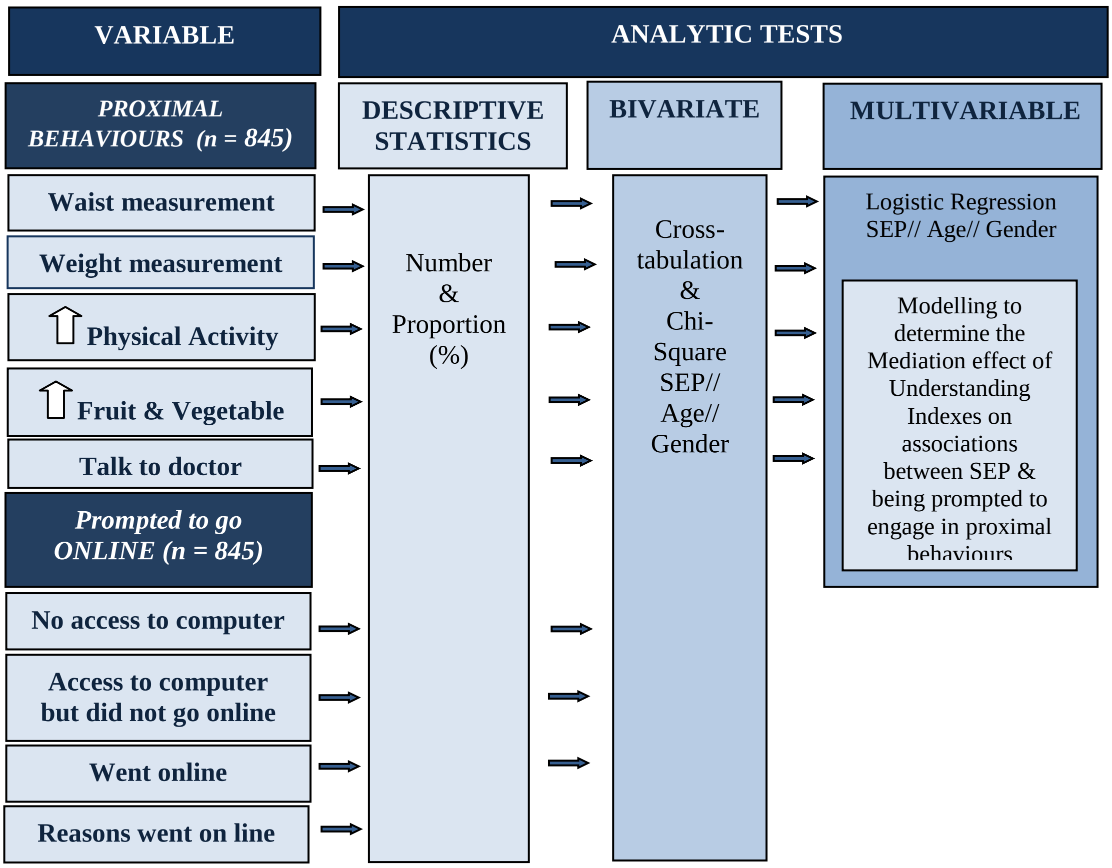
Did have computer access but did not go online to the Measure Up website

Cross tabulations and Chi square analyses were performed to identify relationships between age, gender, education, occupation, and income, and not going online to pursue further information.

The Analytic diagram

In the analytic diagram (Figure 3.19) the proximal behaviour variables are listed in the left hand column. Below these behaviours are depicted outcome variables related to whether the campaign prompted respondents to go online to the *Measure Up* website and reason/s for doing so. Analytic tests for each item are indicated on the right.

Figure 3.19 Analytic diagram: Research Question 3

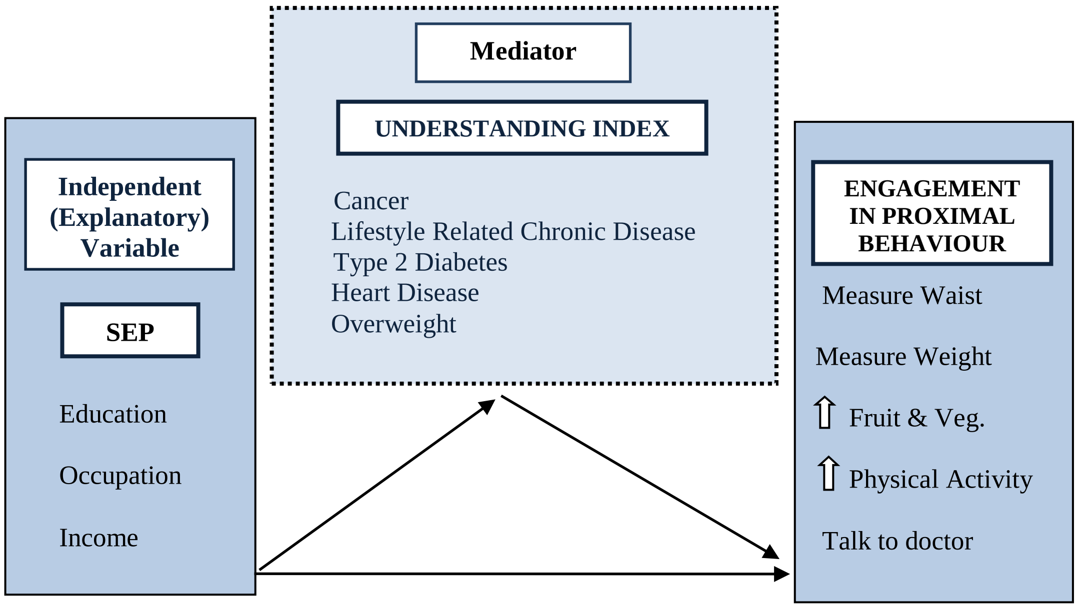


3.6.3.5 EXPLORING THE EFFECTS OF THE UNDERSTANDING INDEX IN THE RELATIONSHIP BETWEEN SEP AND BEING PROMPTED BY THE MEASURE UP CAMPAIGN TO ENGAGE IN PROXIMAL BEHAVIOURS

It was hypothesised that respondents' knowledge and understanding levels may mediate their being prompted to engage in proximal behaviours and thus mediate the effect of SEP (Figure 3.20). For reasons of parsimony and so as not to make assumptions of linearity between understanding and behaviour, it was decided to categorise the understanding indexes into tertiles reflecting high, medium, and low levels of understanding.

To minimise the potential for loss of information when continuous data are converted to categorical data (Woodward, 2005, p93), I undertook a sensitivity test aimed at creating the smallest number of categories for analysis and at the same time maintaining optimum sensitivity. For details please see Appendix H.

Figure 3.20 Conceptual model hypothesising relationships between SEP, the Understanding Indexes and proximal behaviour



3.7 TEST-RETEST RELIABILITY

A test-retest reliability analysis was performed to assess consistency of response to the study questionnaire over time. The test-retest study gained approval (No. 1000000199) from the Queensland University of Technology Research Ethics Unit.

3.7.1 TEST-RETEST METHOD

3.7.1.1 SAMPLE

Respondents in the main study who indicated a willingness to participate in follow-up research regarding this study completed their contact details on the final page of the questionnaire. Approximately 700 respondents to the main survey gave their contact details and this provided an initial population from which to select a sample to participate in the test-retest reliability study.

A post-stratification (by education) selection method was used to select equal numbers of recipients from each socioeconomic group. Participants who did not provide their level of education were excluded and those remaining were stratified by education level. The ten education level options in the study questionnaire were collapsed into 3 broad groups, School only, Certificate/ Trade/ Diploma, and Bachelor degree and over. Equal numbers of potential participants were randomly selected from each group.

Attention was paid to similarity in numbers of males and females, numbers in each age band, and similarity in the month of survey return per group. The most recent 100 returns in each education level group were selected by way of meeting the above criteria. When criteria were not met, the respondent was replaced by the next most recent respondent of the required age band or gender from the population sample. Comparative characteristics of each group are depicted in Table 3.22.

Table 3.22 Education group comparisons by survey return date, gender, and age

Comparison variable	Group 1[1] School only N=100	Group 2[2] Cert / Trade/Diploma N=100	Group 3[3] Bachelor degree & over N=100
Survey return			
July	5	0	16
August	86	89	78
September	9	11	6
Gender			
Male	46	48	54
Female	54	52	46
Age band			
45 - 50 years	30	41	39
51 - 54 years	27	19	24
55 - 60 years	43	40	37

[1] School only (year 12 and under) n = 185
[2] Trade/ Certificate/ Diploma/Assoc. Degree n = 191
[3] Bachelor degree and higher n = 197

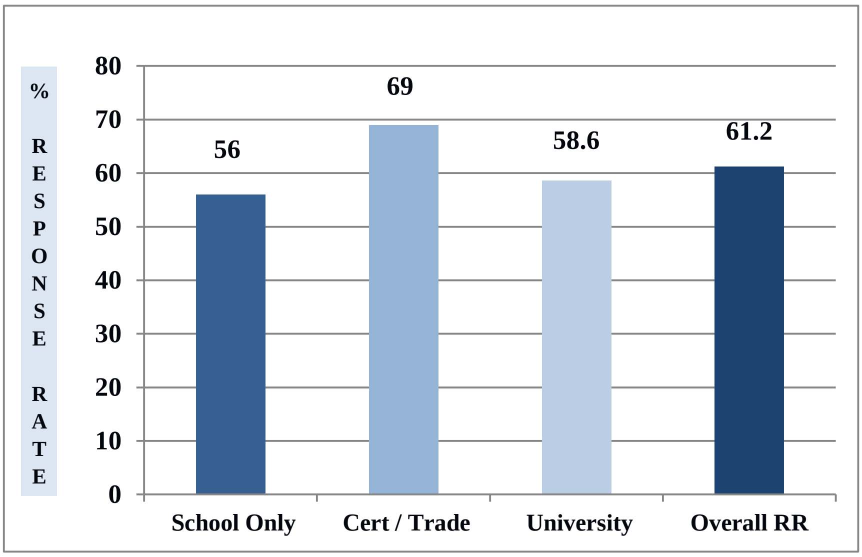
3.7.1.2 TEST-RETEST TIMELINE

The timing of the mail out of the main survey ('test' segment of the test-retest) was constrained by academic demands, avoidance of school holidays for study participants, and the need to post the questionnaire in close proximity to the television delivery of the campaign advertisements. As previously described, the main survey mail-out was administered according to the Dillman Tailored Design Method (2000) and posted out over a 6-7 week period. Responses arrived between 2 and 117 days. In late September and early October, 2010, 300 retest surveys were posted, staggered according to time from return of the test survey. The survey included a letter explaining the additional study and included a small lottery gratuity.

Participant response to test

An overall response rate of 61.2% was achieved for the post-test. One respondent from the higher socioeconomic group returned a blank survey with a note indicating that they were too busy to participate. The remaining responses were grouped by education level as described above. The proportion of respondents in each socioeconomic group (mail-out numbers = 100 in each) who returned the retest survey are depicted in Figure 3.21. Participants with least education achieved a response of 56%, those with middle education levels responded at 69% and those with bachelor degrees or higher responded at 58.26%.

Figure 3.21 Test-Retest response rates by education level



3.7.2 TEST-RETEST RELIABILITY ANALYSIS

The usefulness of a measure to predict behaviour or evaluate the effectiveness of an intervention may be called into question if the measure elicits inconsistent responses from the same individual at different times (Chen & Krauss, 2004). Intra-method reliability analyses include methods that determine whether an instrument will elicit consistency in responses from the same participant at different times (Armstrong, White, & Saracci, 1994, p78) and will be discussed later in this section. There are however many factors that may influence an individual's response to differ or not between the two occasions of measurement, one of these pertinent to this study being the time between test and retest.

Short periods of time may increase the likelihood of individuals' recall of responses given in the earlier test. This likelihood can be minimised by separation of the test and retest by at least 1 month (Armstrong et al., 1994, p93). If the separation period between tests is too long, however, for example in the case of evaluating the effectiveness of an intervention on a behaviour; the behaviour may well have had time to change and thus the differing answers at each time point would be correct rather than inconsistent. In this case the time between the tests might be considered a source of measurement error (Armstrong et al., 1994, p 93).

Test-retest return time in this study ranged broadly from 24 to 117 days and thus the question arose as to whether estimates of test-retest reliability differed between recipients who returned their retest in either the former or the latter half of this period. The median number of days was calculated and rounded to the nearest week (8 weeks or 63 days) and the total group split into two at this approximately median point. Comparisons in reliability coefficients were made between the Total TRT days group (n = 153), the 63 days and less group (n = 86), and the 64 days and higher group (n = 67).

For categorical data, intra-method reliability of the knowledge/understanding scores, and behavioural items between the test and retest surveys was determined by estimates of both percentage agreement and Cohen's Kappa statistic (Armstrong et al., 1994, p96). For reliability of the continuous data in the Understanding Indices, the stability of scores within each measure was estimated using Intra-class Correlation Coefficients (Armstrong et al., 1994, p96).

Percentage agreement reflects a point by point reliability (Birkimer & Brown, 1979) and is calculated by adding the number of cases in which the same score was given at both time points and dividing by the total number of cases scored. Because of the dangers of artificial inflation of the percentage agreement, as well as neglecting the contribution of chance to the consistency of scores (Hayes & Hatch, 1999), Cohen's Kappa statistic was calculated to adjust for any agreement that could be expected only by chance. Kappa values are interpreted using the strength of agreement scale of Landis and Koch (1977).

3.7.3 TEST-RETEST RESULTS

3.7.3.1 RELIABILITY OF KNOWLEDGE / UNDERSTANDING ITEMS

Table 3.23 compares Kappa coefficients and percentage agreement statistics for 3 time periods taken by respondents for return of the retest surveys. Of the 49 Knowledge/ Understanding items, 1 item (cancer is an illness that can occur at any age) achieved 100% agreement. Higher Kappa coefficients were observed in the proximal rather than distal period for the scores of 30 items (61.2%), but higher % agreements were observed in the scores of only 20 items (40.8%) in the same comparative periods.

Using the strength of agreement scale of Landis and Koch (1977), of the 49 Knowledge/ Understanding items, 6.1% achieved ‘Slight’ agreement (0.00-0.20), 38.8% achieved ‘Fair’ agreement (0.21-0.41), 37% achieved ‘Moderate’ agreement (0.41-0.60), 14.3% achieved ‘Substantial’ agreement, and 2% achieved ‘Almost Perfect’ agreement (0.81-1.00). Average Kappa coefficients for each CDRF area achieved ‘Fair’ to ‘Moderate’ agreement and are as follows: Cancer: 0.584, LRCD: 0.301, T2D: 0.401, Heart Disease: 0.497, Overweight: 0.486.

Table 3.23 Comparison of item Kappa and % Agreement estimates

Knowledge Item	Total days 24-117 (N = 153) Kappa	p. value	% Agree	≤ 63 days (n= 86) Kappa	p. value	% Agree	≥ 64 days (n= 67) Kappa	p. value	% Agree
Cancer									
Any age	1.000	0.001	100.0	1.000	0.001	100.0	[2]	[2]	100.0
Abnormal cells	0.508	0.001	95.2	0.462	0.001	92.8	0.660	0.001	98.4
Forms a lump	0.436	0.001	95.2	0.541	0.001	91.6	-0.032[3]	0.796	93.8
Prevention	0.464	0.001	74.8	0.442	0.001	73.5	0.493	0.001	76.6
Cause of death	0.460	0.001	89.8	0.477	0.001	88.0	0.403	0.001	92.2
LRCD									
Lasts > 6 months	0.505	0.001	85.2	0.534	0.001	85.4	0.470	0.001	85.1
Only in elderly	0.291	0.001	92.0	0.283	0.009	90.4	0.306	0.008	94.0
Cured- meds	0.335	0.001	80.7	0.326	0.003	79.5	0.348	0.004	82.1
Prevented-PA	0.315	0.001	68.9	0.259	0.019	65.4	0.386	0.001	73.1
Too late	0.153	0.051	94.0	-0.038[3]	0.689	90.4	0.660	0.001	98.5
Pain	0.200	0.013	94.2	0.131	0.222	83.5	0.319	0.003	89.6
Waistline	0.558	0.001	91.4	0.621	0.000	91.8	0.452	0.001	91.5
Risk-PA	0.242	0.003	88.0	0.257	0.016	85.5	0.215	0.039	91.5
Risk-F&V	0.226	0.005	73.5	0.249	0.023	77.4	0.199	0.091	68.7
Water	0.496	0.001	75.3	0.392	0.001	70.2	0.628	0.001	81.8
Type 2 Diab									
Waist	0.393	0.001	88.4	0.301	0.003	84.1	0.568	0.001	93.8
High sugar	0.530	0.001	79.0	0.552	0.001	80.5	0.505	0.001	77.1
Insulin	0.270	0.001	72.7	0.276	0.012	72.0	0.258	0.044	73.8
Eat sugar	0.240	0.004	72.7	0.273	0.014	71.6	0.173	0.172	74.2
Only elderly	0.091	0.270	86.1	0.126	0.253	82.9	-0.045[3]	0.706	90.3
Preventable	0.487	0.001	86.0	0.452	0.001	85.4	0.536	0.001	86.9
Glucose	0.488	0.001	79.1	0.365	0.001	73.4	0.660	0.001	86.7
Heart attack	0.304	0.001	65.3	0.125	0.215	55.0	0.462	0.001	78.1
Skin cancer	0.473	0.001	74.5	0.358	0.001	69.1	0.616	0.001	81.3
Blindness	0.754	0.001	91.7	0.767	0.001	92.6	0.740	0.001	90.6
Stroke	0.451	0.001	74.5	0.414	0.001	71.6	0.496	0.001	78.1
Kidney damage	0.500	0.001	78.8	0.411	0.001	74.7	0.623	0.001	84.1
Loss of limb	0.607	0.001	87.1	0.644	0.001	89.2	0.565	0.001	84.4
Impotence	0.610	0.001	80.7	0.552	0.001	78.0	0.682	0.001	84.1
Heart Disease									
Known as	0.359	0.001	88.4	0.486	0.001	87.8	-0.047[3]	0.676	89.0
Vessels to lungs	0.410	0.001	70.6	0.375	0.001	68.7	0.447	0.001	73.0
Heart muscle	0.365	0.001	90.4	0.418	0.001	91.5	0.304	0.014	89.1
Angina	0.334	0.001	82.3	0.410	0.001	86.7	0.255	0.041	76.6
Muscle dies	0.618	0.001	83.2	0.661	0.001	89.0	0.565	0.001	81.0
Cured by meds	0.352	0.001	67.1	0.380	0.001	68.7	0.296	0.018	65.1
Disability	0.688	0.001	96.6	0.708	0.001	96.3	0.652	0.001	96.9
Lifestyle	0.452	0.001	85.0	0.453	0.001	85.5	0.452	0.001	84.4
Parents	0.556	0.001	84.4	0.579	0.001	83.1	0.488	0.001	85.9
Overweight									
Skin cancer	0.421	0.001	81.0	0.438	0.001	82.6	0.399	0.001	79.1
Breast cancer	0.513	0.001	77.1	0.563	0.001	80.2	0.459	0.001	73.1
Prostate cancer	0.433	0.001	79.1	0.544	0.001	83.7	0.304	0.009	73.1
Leukaemia	0.373	0.001	68.6	0.413	0.001	70.9	0.298	0.015	65.7
Bowel cancer	0.475	0.001	73.9	0.484	0.001	74.4	0.470	0.001	73.1
Fat in abdomen	0.514	0.001	74.5	0.606	0.001	83.7	0.386	0.001	77.6
Coats organs	0.363	0.001	81.0	0.518	0.001	84.9	0.135	0.256	76.1
Eat less snacks	0.345	0.001	93.4	0.338	0.001	91.9	0.377	0.002	95.5
More F&V	0.510	0.001	95.4	0.517	0.001	94.2	0.484	0.001	97.0
Exercise 30 m	0.231	0.003	96.1	0.261	0.007	94.1	[2]	[2]	100.0
Energy	0.619	0.001	91.5	0.659	0.001	90.6	0.505	0.001	92.5

1 Excluded are participants unaware of the campaign or whose awareness changed between Test and Retest.
2 Statistics not computable because at least 1 must be a constant.
3 Negative Kappa values due to 0 participants in either category. Rarely, Kappa can be negative and is a sign that the two observers agreed less than would be expected just by chance.

3.7.3.2 RELIABILITY OF UNDERSTANDING INDICES AND MEDIA CHANNEL EXPOSURE INDEX

Table 3.24 presents comparisons of Intra-class Correlation Coefficients (ICCs) for the 3 periods of test-retest return times. ICCs for the Cancer, Heart Disease, and Overweight indices were higher in the proximal than the distal period. Indices for LRCD and T2D attained greater agreement with retests returned in the distal period. ‘Moderate’ strength agreement was attained for the MCEI, slightly higher for retest returns in the proximal period.

Table 3.24 Comparison of Understanding Index ICCs between time periods

Index	Items/ Index	N[1]	ICC	95% CI	Reliability[2]
Total days: range 24-117					
Cancer	5	153	0.355	0.21; 0.49	Fair
Lifestyle Related Chronic Disease	10	153	0.420	0.28; 0.54	Moderate
Type 2 Diabetes	14	153	0.624	0.52; 0.71	Substantial
Heart Disease	9	153	0.513	0.39; 0.62	Moderate
Overweight	11	153	0.652	0.55; 0.73	Substantial
Media Channel Exposure	7	153	0.562	0.44; 0.66	Moderate
≤ 63 days					
Cancer	5	86	0.429	0.24; 0.59	Moderate
Lifestyle Related Chronic Disease	10	86	0.373	0.18; 0.54	Fair
Type 2 Diabetes	14	86	0.618	0.47; 7.3	Substantial
Heart Disease	9	86	0.575	0.42; 0.70	Moderate
Overweight	11	86	0.729	0.61; 0.81	Substantial
Media Channel Exposure	7	86	0.571	0.41; 0.70	Moderate
≥ 64 days					
Cancer	5	67	0.207	-0.03; 0.42	Slight
Lifestyle Related Chronic Disease	10	67	0.496	0.29; 0.66	Moderate
Type 2 Diabetes	14	67	0.636	0.47; 0.76	Substantial
Heart Disease	9	67	0.421	0.20; 0.60	Moderate
Overweight	11	67	0.545	0.35; 0.69	Moderate
Media Channel Exposure	7	67	0.552	0.36; 0.70	Moderate

[1] Excluded are participants whose awareness of the campaign changed between Test and Retest, and participants who were unaware of the campaign.
[2] Scale of strength for reliability coefficients (Landis and Koch, 1977).

3.7.3.3 RELIABILITY OF ITEMS MEASURING CAMPAIGN EFFECTIVENESS

Table 3.25 depicts reliability of survey items that measured campaign effectiveness in prompting proximal behaviours. Reliability by Kappa coefficient was higher in the proximal period for 4 behaviour items; waist measurement, self-weight, and fruit and vegetable increase all achieved ‘Moderate’ strength of agreement, whilst going online to the *Measure Up* website achieved ‘Substantial’ agreement according to the Landis and Koch (1977) scale. Two items, however, were markedly greater in magnitude in the distal period; the prompting of physical activity with Kappa 0.702 achieved ‘Substantial’ strength of agreement, and talking to the doctor about prevention, Kappa 0.858 achieved ‘Almost Perfect’ on the Landis and Koch scale. Percentage agreement was lower for 4 of 6 items in the proximal half.

Table 3.25 Comparison of Behavioural Kappa and % Agreement estimates between time periods

	Test-Retest Time 24-117 days (n = 153)			Test-Retest Time ≤ 63 days (n = 86)			Test-Retest Time ≥ 64 days (n = 67)		
Behaviour	**Kappa**	**p. value**	**% Agree**	**Kappa**	**p. value**	**% Agree**	**Kappa**	**p. value**	**% Agree**
Measure waist	0.555	0.001	78.9	0.552	0.001	77.7	0.515	0.001	80.3
Weight	0.545	0.001	77.3	0.593	0.001	80.2	0.448	0.001	73.1
Increase physical activity	0.581	0.001	79.1	0.479	0.001	74.1	0.702	0.001	85.1
Increase fruit & veg	0.518	0.001	75.8	0.532	0.001	76.5	0.465	0.001	74.6
Talk to doctor about prevention	0.692	0.001	92.1	0.572	0.001	88.1	0.858	0.001	97.0
Go online to Measure Up website	0.515	0.001	91.2	0.622	0.001	90.1	-0.025[2]	0.768	92.4

[1] Excluded are participants were unaware of the campaign or whose awareness changed between Test and Retest.
[2] Negative Kappa values due to 0 participants in either category. Rarely, Kappa can be negative and is a sign that the two observers agreed less than would be expected just by chance.

3.7.4 DISCISSION AND IMPLICATIONS

3.7.4.1 DISCUSSION OF TEST RESULTS

The post stratification selection method provided an even socioeconomic spread on which to test reliability of the questionnaire. Other factors in favour of the method include firstly; participants not knowing when they completed the first test that they would complete a retest thus responses would not be influenced by knowledge that responses would be validated in a later test (Armstrong et al, 1994, p 94). Secondly, postage costs were also minimised by not having to post a new set of 300 ‘test’ items.

One factor of detriment to the method was the wide time-span over which retest surveys were returned. Information in the first test may have affected subsequent presentations of the stimuli (Krauss & Chen, 2004, p 1120); for example if items in the first survey stimulated participants to seek out information that they did not know, or pertinent to this study, take more notice of campaign information thus altering their response in the second survey. This possibility was supported to a degree by the greater magnitude of agreements in the proximal sample when the time between answers was shorter compared to the distal sample when time period between answers was longer.

In general, reliability estimates were stronger in the proximal period rather than the distal or total time periods. Strength of agreement for most knowledge / Understanding test items ranged between ‘Fair’ and ‘Substantial’ with only 3 items observed to have slight agreement whilst agreement in the indices for these items grouped by CDRF were of greater magnitude. Reliability of behavioural items were all of ‘Moderate’ to ‘Substantial’ agreement between test and retest surveys.

3.7.4.2. IMPLICATIONS FOR THIS STUDY

Kappa coefficients for individual items in CDRFs of Cancer, Heart Disease and Overweight indicated a moderate or greater level of reliability. Individual item coefficients in the LRCD section and to a lesser extent Type 2 Diabetes, however, indicated poorer reliability, paralleling readability estimates for these sections discussed earlier (Table 3.2), and thus may be associated. Mindfulness of this potential association will be important when interpreting results in the LRCD and T2D sections. However in all time periods 4 of the 5 understanding indices attained between moderate and substantial reliability as determined by ICC, and Kappa coefficients for campaign effects on behaviour change were all between moderate and perfect. These results indicate considerable reliability in the survey.

3.8 CHAPTER SUMMARY

This chapter began with a discussion of previous approaches to investigating socioeconomic differences in response to mass media health promotion campaigns, and provides a rationale for use of the mail survey method in this thesis research. The study design section includes definition of the study sample, data collection by the Tailored Design Method, and survey development. Measurement and analysis of variables are presented in terms of addressing the three research questions, and finally an account is given of the test-retest conducted to establish questionnaire reliability. The next chapter will present results of analyses grouped by the concepts of Reach, Understanding, and Effectiveness to address the research questions.

Chapter 4: Results

4.0 INTRODUCTION

This chapter presents the results of analyses that examined relationships between the socioeconomic position of participants, and their awareness, understanding and response in behavioural terms to mass media health campaign messages. The results are presented in accordance with the components of the RUE framework: i) campaign reach, ii) understanding of the campaign language, and iii) effectiveness of the campaign in terms of proximal behaviour change. Results of age and gender analyses are presented in Appendix F.

4.1 RESULTS ADDRESSING RESEARCH QUESTION 1: *What is the relationship between socioeconomic position and Reach in mass media health promotion campaigns?*

4.1.1 SOCIOECONOMIC POSITION AND AWARENESS OF THE *MEASURE UP* CAMPAIGN

Table 4.1 examines the association between respondents' SEP and awareness of the *Measure Up* campaign. Statistically significant bivariate associations were observed between education (p=0.001), occupation (p=0.006), household income (p=0.016) and awareness of the campaign, with rates of awareness being lowest among those with no post-school qualifications, blue collar workers and residents of low income households.

The multivariable association between SEP (adjusted for age and gender) and awareness indicated that the odds of being unaware of the campaign were highest among the least educated (OR 2.34, 95% CI 1.47-3.72), blue collar workers (OR 2.35, 95%CI 1.38-4.00) and low income respondents (OR 2.06, 95% CI 1.10-3.83).

Table 4.1 Relationships between SEP and awareness of the *Measure Up* campaign

Analytical Sample (N = 984)	**Aware of campaign** (n = 845)			**Not aware of campaign** (n = 139)			
	n	%		n	%	OR[1]	(95%) CI
Education level[2]							
Bachelor degree or higher[3]	326	91.1		32	8.9	1.00	--
Diploma/Associate degree	116	87.2		17	12.8	1.50	0.80, 2.80
Certificate/Trade	138	82.1		30	17.9	**2.26**	**1.32, 3.88**
No post-school qualification	261	81.3		60	18.7	**2.34**	**1.47, 3.72**
p.value[4]			***0.001***				
Occupational status[5,6]							
Managers/Professionals[3]	358	89.5		42	10.5	1.00	--
White collar workers	229	83.9		44	16.1	**1.60**	**1.01, 2.56**
Blue collar workers	105	78.9		28	24.6	**2.35**	**1.38, 4.00**
p.value[4]			***0.006***				
Yearly household income[7,8]							
High[3]	243	88.4		32	11.6	1.00	--
Middle	233	88.9		29	11.1	0.93	0.55, 1.60
Low-middle	190	82.3		41	17.7	1.58	0.95, 2.63
Low	72	78.3		20	21.7	**2.06**	**1.10, 3.83**
p.value[4]			***0.016***				

[1] Odds Ratios for all variables are age and gender adjusted.
[2] Missing are 4 respondents who did not answer the question regarding their education level.
[3] For each socioeconomic indicator, the 1st category is the referent category.
[4] P. value relates to the significance of the bivariate association between the SEP indicator and being aware of the campaign.
[5] Missing are 12 respondents who did not answer the question regarding their occupation.
[6] NEC (Not Easily Classified) includes respondents whose occupations were not easily classifiable such as those studying, unemployed, permanently unable to work, retired, and engaged in home duties on a full-time basis (see profile Table 3.5). NEC category (N= 692) excluded from Chi Square analysis as heterogeneity of the group made interpretation difficult.
[7] Missing are 124 respondents including 25 who did not answer the question regarding their income, 8 who did not know their income and 91 who chose the option of not wishing to answer the question.
[8] Yearly Household Income AU$: High: >130,000, Middle: 72,800-129,999, Low-middle: 31,200-72,799, Low: < 31,199.

4.1.2 SOCIOECONOMIC POSITION AND EXPOSURE TO THE *MEASURE UP* CAMPAIGN BY MEDIA CHANNEL

Table 4.2 presents bivariate associations between SEP and the media channel/s by which respondents were exposed to the *Measure Up* campaign. Statistically significant relationships were observed between education and exposure at a bus shelter (p=0.018) and via newspapers and magazines (p=0.012), with the lower educated groups being less likely to see the *Measure Up* campaign via these channels. A statistically significant relationship was found between occupation and exposure to the campaign at a bus shelter (p=0.003), with higher proportions of Managers and Professionals reporting exposure via this channel. There were no significant relationships between income and media channel exposure.

Table 4.2 Bivariate relationships between SEP and media channel exposure of the *Measure Up* campaign

	TV[1]		Radio[1]		Bus[1] shelter		Shopping[1] centre		News/ Mags[1]		Shopping[1] trolley	
	n	%	n	%	n	%	n	%	n	%	n	%
Education												
Bachelor / higher	303	93.2	24	7.4	62	19.1	59	18.2	123	37.8	13	4.0
Dip/Ass. degree	113	97.4	11	9.5	18	15.5	19	16.4	50	43.1	2	1.7
Certificate/Trade	129	93.5	14	10.1	22	15.9	13	9.4	38	27.5	2	1.4
No post-school	243	93.8	24	9.3	25	9.7	39	15.1	77	29.7	9	3.5
p.value	*0.418*		*0.735*		***0.018***		*0.125*		***0.012***		*0.395[2]*	
Occupation[3]												
Managers/Profs	337	94.7	33	9.3	73	20.5	68	19.1	120	33.7	13	3.7
White collar	222	96.9	19	8.3	26	11.4	29	12.7	84	36.7	3	1.3
Blue collar	97	92.4	14	13.3	11	10.5	18	17.1	32	30.5	4	3.8
p.value	*0.177*		*0.340*		***0.003***		*0.124*		*0.519*		*0.214*	
Income level[4]												
High	228	93.8	20	8.2	37	15.2	33	13.6	81	33.3	5	2.1
Middle	226	97.4	18	7.8	29	12.5	41	17.7	78	33.6	5	2.2
Low-middle	177	93.2	21	11.1	33	17.4	34	17.9	74	38.9	10	5.3
Low	65	91.5	7	9.9	11	15.5	6	8.5	22	31.0	2	2.8
p.value	*0.116*		*0.646*		*0.572*		*0.168*		*0.519*		*0.197[1]*	

1 Number of cases for each media channel ranged from N = 841 to N = 842.
2 P.value may be unreliable due to cell counts < 5.
3 N= 690. NEC category excluded from Chi Square analysis. Interpretation difficult due to heterogeneity of group. NEC includes respondents whose occupations were not easily classifiable, studying, unemployed, permanently unable to work, retired, and engaged in home duties on a full-time basis (see profile Table 3.5).
4 Yearly household income: AU$, High: >$130,000, Middle: $72,800-$129,999, Low-middle: $31,200-72,799, Low: < $31,199.

Table 4.3 presents results of age and gender adjusted multivariable analyses of the likelihood of respondents from each socioeconomic group being exposed to the *Measure Up* campaign via each media channel. Each media channel was analysed separately. Compared to those with a bachelor degree or higher, respondents with no post school qualifications were less likely (OR 0.47; 95% CI 0.28 - 0.78) to be exposed to campaign information via posters in bus shelters, and via newspapers and magazines (OR 0.67, 95% CI 0.47-0.95). Respondents with a certificate or trade level of education were significantly less likely (OR 0.50; 95% CI 0.26 - 0.95) to see campaign information at a shopping centre, and although not reaching statistical significance, less likely to be exposed via newspapers or magazines.

There were significant differences in media channel exposure by occupational group. Blue collar workers (OR 0.48; 95% CI 0.24 – 0.95) and white collar workers (OR 0.48; 95% CI 0.29 – 0.78) were significantly less likely than Managers/ Professionals to see the campaign advertisements at a bus shelter. White collar workers were less likely than Managers/ Professionals to see advertisements at a shopping centre (OR 0.54; 95% CI 0.34 – 0.88).

There were no significant associations between respondents' household income and media channel exposure.

Table 4.3 Multivariable relationships between SEP and media channel exposure[1] to the *Measure Up* campaign

	TV[2]		Radio[2]		Bus shelter[2]		Shopping[2] centre		News/Mags[2]	
	OR[3]	(95%) CI	OR[3]	(95%) CI	OR[3]	(95%) CI	OR[3]	(95%) CI	OR[3]	(95%) CI
Education level[4]										
Bach/ higher	1.00	--	1.00	--	1.00	--	1.00	--	1.00	--
Dip/Ass. Deg.	2.74	0.81, 9.35	1.32	0.62, 2.78	0.77	0.43, 1.37	0.89	0.50, 1.57	1.26	0.82, 1.94
Cert/Trade	1.00	0.45, 2.25	1.42	0.71, 2.85	0.82	0.48, 1.41	**0.50**	**0.26, 0.95**	0.66	0.42, 1.02
No post school	1.12	0.57, 2.21	1.34	0.74, 2.44	**0.47**	**0.28, 0.78**	0.80	0.51, 1.25	**0.67**	**0.47, 0.95**
Occupation [5,6]										
Man/ Profs	1.00	--	1.00	--	1.00	--	1.00	--	1.00	--
White collar	1.95	0.80, 4.78	0.90	0.49, 1.64	**0.48**	**0.29, 0.78**	**0.54**	**0.34, 0.88**	1.05	0.73, 1.50
Blue collar	0.61	0.26, 1.47	1.52	0.77, 2.99	**0.48**	**0.24, 0.95**	1.01	0.56, 1.82	0.95	0.59, 1.53
Income level[7,8]										
High	1.00	--	1.00	--	1.00	--	1.00	---	1.00	--
Middle	2.47	0.94, 6.50	0.95	0.49, 1.85	0.81	0.48, 1.36	1.33	0.81, 2.20	0.98	0.67, 1.43
Low-middle	0.83	0.38, 1.83	1.44	0.74, 2.79	1.32	0.77, 2.24	1.30	0.76, 2.22	1.19	0.79, 1.78
Low	0.67	0.25, 1.83	1.29	0.52, 3.22	1.11	0.53, 2.33	0.58	0.23, 1.45	0.86	0.48, 1.53

[1] Media channels ‘Shopping trolley’ and ‘Can’t remember’ excluded due to low respondent numbers.
[2] Number of cases for each media channel ranged from N = 841 to N = 842.
[3] Odds ratios for all variables are adjusted for age and gender.
[4] Excludes missing data from 4 respondents who did not answer the question regarding education level.
[5] Excludes missing data from 12 respondents who did not answer the question regarding occupational status.
[6] Results for the NEC category are not presented. Difficult to interpret with confidence or reliability due to heterogeneity of the group. NEC includes respondents whose occupations were Not Easily Classifiable, studying, unemployed, permanently unable to work, retired, and engaged in home duties on a full-time basis (see profile Table 3.5).
[7] Yearly household income: AU$, High: >$130,000, Middle: $72,800 - $129,999, Low-middle: $31,200 - $72,799, Low: < $31,199.
[8] Excludes missing data from 106 respondents who did not answer the question regarding yearly household income.

4.1.3 RELATIONSHIPS BETWEEN SEP INDICATORS AND TOTAL MEDIA CHANNEL EXPOSURE TO THE *MEASURE UP* CAMPAIGN

EDUCATION

Table 4.4 presents the results of linear regression analyses that examine the association between education and the total number of media channels by which respondents were exposed to the *Measure Up* campaign. The outcome variable is a media channel exposure index (MCEI) that ranges between 0–6, with higher scores indicating exposure to more media channels. A more detailed description of this measure can be found in Chapter 3, page 118. The results are presented for education level adjusted by age and gender in Model 1, with additional adjustment for occupation only in Model 2, and household income only in Model 3. Finally in Model 4, education is adjusted for all socioeconomic measures simultaneously. Compared to those with a bachelor degree or higher, respondents with no post-school qualifications were exposed to the campaign via significantly fewer ($p \leq 0.05$) media channels (Model 1). When Model 1 is adjusted for the effects of occupation (Model 2) the difference in mean scores of respondents with no post-school qualifications and the referent group is no longer significant. However when adjusted for the effects of household income (Model 3) the scores of those with no post-school qualifications regain significance ($p<0.037$). Finally, when the model is adjusted for both occupation and household income, the effect of education level on the media channel exposure score is no longer significant.

OCCUPATION

Table 4.5 presents results of linear regression analyses that examine the association between occupation and the number of media channels by which respondents were exposed to the *Measure Up* campaign. The mean MCEI scores described above are presented for respondents in each level of occupation (Model 1). No significant associations suggests that respondents' occupation did not have any effect on the number of media channels by which they were exposed. When this model was adjusted for both income alone, education alone, and income and education together, the effect of occupation on the number of media channels to which respondents were exposed was not statistically significant.

Table 4.4 Relationships between Education and total media channel exposure to the *Measure Up* campaign

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p.value
Education																
Bach./ higher	1.00	--	--	--	1.00	--	--	--	1.00	--	--	--	1.00	--	--	--
Dip/ Ass. degree	0.037	0.11	-0.181, 0.256	0.737	0.056	0.12	-0.173, 0.284	0.633	-0.006	0.12	-0.240, 0.228	0.959	0.016	0.13	-0.229, 0.261	0.898
Cert/ Trade	-0.174	0.11	-0.381, 0.033	0.099	-0.162	0.12	-0.394, 0.069	0.168	-0.225	0.12	-0.452, 0.003	0.053	-0.217	0.13	-0.470, 0.035	0.091
No post-school	-0.171	0.09	-0.341, 0.000	**0.050**	-0.123	0.10	-0.318, 0.072	0.215	-0.205	0.10	-0.398, -0.012	**0.037**	-0.171	0.11	-0.386; 0.044	0.119
Occupation[6]																
Man./ Professionals					1.00	--	--	--					1.00	--	--	--
White collar					-0.112	0.10	-0.304, 0.080	0.253					-0.120	0.11	-0.329, 0.088	0.257
Blue collar					0.046	0.13	-0.210, 0.302	0.726					0.013	0.14	-0.261, 0.286	0.927
Income																
High									1.00	-	-	-	1.00	-	-	-
Middle									0.067	0.10	-0.124, 0.258	0.490	0.064	0.10	-0.129, 0.257	0.513
Low-Middle									0.232	0.11	0.021, 0.442	**0.031**	0.267	0.11	0.050, 0.485	**0.016**
Low									0.038	0.15	-0.248, 0.324	0.794	0.106	0.16	-0.202, 0.415	0.499

[1] Index of 6 media channels. Possible score 0-6 (6 indicates total range of media channels).
[2] Model 1 = Education/ Age/ Gender.
[3] Model 2 = Education / Occupation/Age/ Gender.
[4] Model 3 = Education / Income / Age / Gender.
[5] Model 4 = Education / Occupation/ Income/ Age/ Gender.
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the multivariable modelling they are a very mixed group, difficult to interpret with confidence or reliability and thus not presented here.

Table 4.5 Relationships between Occupation and total media channel exposure to the *Measure Up* campaign

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
***Occupation*[6]**																
Man./ Prof.	1.00	--	--	--	1.00	--	--	--	1.00	--	--	--	1.00	--	--	--
White collar	-0.161	0.09	-0.336, 0.015	0.072	-0.186	0.10	-0.377, 0.005	0.057	-0.112	0.10	-0.304, 0.080	0.253	-0.120	0.11	-0.329, 0.088	0.257
Blue collar	-0.045	0.12	-0.273, 0.183	0.697	-0.102	0.13	-0.347, 0.143	0.414	0.046	0.13	-0.210, 0.302	0.726	0.013	0.14	-0.261, 0.286	0.927
Income																
High					1.00	--	--	--					1.00	--	--	--
Middle					0.048	0.10	-0.143, 0.238	0.624					0.064	0.10	-0.129, 0.257	0.513
Low-Middle					0.236	0.11	0.022, 0.450	**0.031**					0.267	0.11	0.050, 0.485	**0.016**
Low					0.073	0.16	-0.232, 0.377	0.639					0.106	0.16	-0.202, 0.415	0.499
Education																
Bach./ higher									1.00	--	--	--	1.00	--	--	--
Dip/ Ass. deg.									0.056	0.12	-0.173, 0.284	0.633	0.016	0.13	-0.229, 0.261	0.898
Cert./ Trade									-0.162	0.12	-0.394, 0.069	0.168	-0.217	0.13	-0.470, 0.035	0.091
No post-sch.									-0.123	0.10	-0.318, 0.072	0.215	-0.171	0.11	-0.386, 0.044	0.119

[1] Index of 6 media channels. Possible score 0-6 (6 indicates total range of media channels).
[2] Model 1 = Occupation / Age / Gender.
[3] Model 2 = Occupation / Income /Age/ Gender.
[4] Model 3 = Occupation / Education / Age / Gender.
[5] Model 4 Occupation / Income/ Education/ Age/ Gender.
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the multivariable modelling they are a very mixed group, difficult to interpret with confidence or reliability and thus not presented here.

YEARLY HOUSEHOLD INCOME

Table 4.6 presents the mean MCEI scores of respondents in each level of yearly household income (Model 1). Whilst the mean scores of the lower income groups are lower than the higher income referent group, the differences are not statistically significant until adjusted for education ($p=0.031$) in Model 2. In Model 3, when adjusted for effects of occupation alone mean scores of low-middle income respondents are again significantly different ($p=0.031$) from those of the referent group. In Model 4, income is adjusted for the effects of both education and occupation and result in significantly lower mean MCEI scores ($p=0.016$) for respondents of low-middle income than those of the higher income referent group.

Table 4.6 Relationships between Income and total media channel exposure to the *Measure Up* campaign

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Income ***(n = 727)***																
High	1.00	--	--	--	1.00	--	--	--	1.00	--	--	--	1.00	--	--	--
Middle	0.029	0.10	-0.158, 0.216	0.760	0.067	0.10	-0.124, 0.258	0.490	0.048	0.10	-0.143, 0.238	0.624	0.064	0.10	-0.129, 0.257	0.513
Low-Middle	0.161	0.10	-0.041, 0.363	0.117	0.232	0.11	0.021, 0.442	**0.031**	0.236	0.11	0.022, 0.450	**0.031**	0.267	0.11	0.050, 0.485	**0.016**
Low	-0.042	0.14	-0.318, 0.234	0.764	0.038	0.15	-0.248, 0.324	0.794	0.073	0.16	-0.232, 0.377	0.639	0.106	0.16	-0.202, 0.415	0.499
Education ***(n = 841)***																
Bach./ higher					1.00	--	--	--					1.00	--	--	--
Dip/ Ass. degree					-0.006	0.12	-0.240, 0.228	0.959					0.016	0.13	-0.229, 0.261	0.898
Cert/ Trade					-0.225	0.12	-0.452, 0.003	0.053					-0.217	0.13	-0.470, 0.035	0.091
No post-school					-0.205	0.10	-0.398, -0.012	**0.037**					-0.171	0.11	-0.386, 0.044	0.119
Occupation[6] ***(n = 833)***																
Man./ Prof.									1.00	--	--	--	1.00	--	--	--
White collar									-0.186	0.10	-0.377, 0.005	0.057	-0.120	0.11	-0.329, 0.088	0.257
Blue collar									-0.102	0.13	-0.347, 0.143	0.414	0.013	0.14	-0.261, 0.286	0.927

[1] Index of 6 media channels. Possible score 0-6 (6 indicates total range of media channels).
[2] Model 1 = Income / Age / Gender.
[3] Model 2 = Income / Education /Age / Gender.
[4] Model 3 = Income / Occupation / Age / Gender.
[5] Model 4 Income / Education / Occupation / Age/ Gender.
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the multivariable modelling they are a very mixed group, difficult to interpret with confidence or reliability and thus not presented here.

4.2 RESULTS ADDRESSING RESEARCH QUESTION 2:
What is the relationship between socioeconomic position and understanding of mass media health promotion campaign messages and language?

This section relates to the 'Understanding' phase of the study model. Results of investigations are presented in a format structured by the 5 chronic disease/ risk factor (CDRF) terms used in the *Measure Up* campaign: Cancer, Chronic Disease, Type 2 Diabetes, Heart Disease, and Overweight.

4.2.1 SOCIOECONOMIC POSITION AND KNOWLEDGE AND UNDERSTANDING ABOUT CANCER

EDUCATION

Table 4.7 examines the association between education level and knowledge about cancer. Statistically significant bivariate associations were found between education and knowledge about cancer and age (p=0.044), the disease process (p=0.001), symptoms of cancer (p=0.018) and preventative lifestyle strategies (p=0.001). For each of these items, the highest proportions of incorrect responses were among respondents with no post-school qualifications.

The results of multivariable analyses show that respondents with least education are significantly more likely than those with tertiary level education to give an incorrect response to items regarding the disease process (OR 6.90, 95% CI 3.12 – 15.23), symptoms of cancer (OR 2.82, 95% CI 1.44 – 5.52), and preventative lifestyle strategies (OR 1.85; 95% CI 1.32 – 2.61). For the item regarding abnormal cells, however, the confidence interval was wide thus the point estimate may be unreliable.

Table 4.7 Relationships between Education level and incorrect knowledge about Cancer

Knowledge Item	% Incorrect[1,2,]					Odds Ratio (95% CI)[3]			
	Bach/ High	Dip/ Ass. Deg.	Cert/ Trade	No post-school	p. value	Bach.	Dip/ Ass. Degree	Cert/ Trade	No post-school
Knowledge about the disease									
Cancer is an illness that can occur at any age	0.3	3.5	0.7	1.2	**0.044**	1.00	**11.54 1.28, 104.50**	2.19 0.14, 35.50	3.55 0.36, 34.92
Cancer is an illness in which abnormal cells multiply and are able to invade other cells	2.5	8.7	6.0	14.2	**0.001**	1.00	**3.72 1.43, 9.69**	2.32 0.85, 6.34	**6.90 3.12, 15.23**
Cancer is an illness that always forms a lump so you know when you have it.	4.3	8.7	6.7	11.2	**0.018**	1.00	2.11 0.90, 4.93	1.48 0.62, 3.54	**2.82 1.44, 5.52**
Knowledge about health effects									
Cancer is an illness that is a major cause of death in the Australian population.	12.4	13.0	17.8	14.6	0.489	1.00	1.06 0.56, 2.02	1.72 0.98, 3.00	1.30 0.77, 2.04
Knowledge about current risk and prevention									
Cancer is an illness in which some cases can be prevented by keeping a healthy weight, being physically active and eating a healthy diet.	32.0	40.0	35.6	47.7	**0.001**	1.00	1.42 0.91, 2.21	1.16 0.76, 1.78	**1.85 1.32, 2.61**

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign, and 75 who did not provide any socioeconomic information.
[2] Number of respondents answering the question ranged 830-832. This includes both those who did not answer the education question nor the knowledge question.
[3] Adjusted for age and gender

OCCUPATION

Table 4.8 examines relationships between occupation and respondents' knowledge about cancer. Statistically significant bivariate associations are observed between respondents' occupation and knowledge about the disease process (p=0.014), and cancer symptoms (p=0.001).

The results of multivariable analyses indicate that Blue Collar workers are significantly more likely than Managers / Professionals to incorrectly answer knowledge items regarding the disease process (OR 2.27; 95% CI 1.07 – 4.81) and cancer symptoms (OR 2.79; 95% CI 1.23 to 6.33).

Table 4.8 Relationships between Occupation and incorrect knowledge about Cancer

	% Incorrect[1,2,3]				Odds ratio (95% CI)[4]		
Knowledge Item	Man/ Profs	White collar	Blue collar	p. value	Man/ Profs	White collar	Blue collar
Knowledge about the disease							
Cancer is an illness that can occur at any age	0.9	0.0	1.9	0.148	1.00	0.00	2.10 0.34, 13.08
Cancer is an illness in which abnormal cells multiply and are able to invade other cells	5.4	5.7	12.6	**0.014**	1.00	1.17 0.56, 2.47	**2.27** **1.07, 4.81**
Cancer is an illness that always forms a lump so you know when you have it.	4.0	6.1	11.7	**0.001**	1.00	1.85 0.85, 4.03	**2.79** **1.23, 6.33**
Knowledge about health effects							
Cancer is an illness that is a major cause of death in the Australian population.	11.6	14.0	13.6	0.674	1.00	1.17 0.70, 1.94	1.38 0.71, 2.67
Knowledge about current risk and prevention							
Cancer is an illness in which some cases can be prevented by keeping a healthy weight, being physically active and eating a healthy diet.	33.5	40.4	40.8	0.169	1.00	1.29 0.91, 1.84	1.38 0.87, 2.17

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign, and 75 who did not provide any socioeconomic information.
[2] Numbers responding to items ranged from 682-683. This includes both those who did not answer the occupation item nor the knowledge item.
[3] Interpretation of the Not Easily Classified (NEC) category was difficult due to the group heterogeneity and thus excluded from Chi Square analyses. The NEC group includes respondents who were studying, unemployed, permanently unable to work, retired, and engaged in home duties on a full-time basis (see profile Table 3.5).
[4] Adjusted for age and gender.

YEARLY HOUSEHOLD INCOME

Table 4.9 examines associations between yearly household income and respondents' knowledge about Cancer. Statistically significant bivariate associations are observed between respondents' income and knowledge about cancer and age (p=0.034), the disease process (p=0.003), cancer symptoms (p=0.009), and cancer outcomes (p=0.044). For the item regarding preventative lifestyle strategies there were high proportions of incorrect answers across all income levels (34.3 – 44.7%); the highest were in low-middle and low income groups but differences did not reach statistical significance.

Results of multivariable analyses show that respondents with the lowest income were significantly more likely than high income respondents to give incorrect answers to items regarding age and cancer (OR 11.43; 95% CI 1.13 – 115.81), the disease process (OR 3.36; 95% CI 1.56 – 8.45), cancer symptoms (OR 4.59; 95% CI 1.83 – 11.55), and cancer outcomes (OR 2.30; 95% CI. For the items regarding age and symptoms however confidence intervals are wide.

Table 4.9 Relationships between yearly household Income and incorrect knowledge about Cancer

	% Incorrect[1,2,3,]					Odds ratio (95% CI)[4]			
Knowledge Item	High	Mid	Low-Mid	Low	p. value	High	Middle	Low-Middle	Low
Knowledge about the disease									
Cancer is an illness that can occur at any age	0.4	0.4	1.6	4.2	**0.034**	1.00	1.10 0.07, 17.71	4.42 0.44, 44.82	**11.43 1.13, 115.81**
Cancer is an illness in which abnormal cells multiply and are able to invade other cells	5.8	4.4	6.9	16.7	**0.003**	1.00	0.80 0.35, 1.8	1.39 0.62, 3.10	**3.63 1.56, 8.45**
Cancer is an illness that always forms a lump so you know if you have it.	4.1	6.1	6.4	15.3	**0.009**	1.00	1.61 0.70, 3.71	1.69 0.70, 4.07	**4.59 1.83, 11.55**
Knowledge about health effects									
Cancer is an illness that is a major cause of death in the Australian population.	12.8	12.3	10.6	23.6	**0.044**	1.00	0.93 0.54, 1.61	0.82 0.44, 1.52	**2.30 1.17, 4.55**
Knowledge about current risk and prevention									
Cancer is an illness in which some cases can be prevented by keeping a healthy weight, being physically active and eating a healthy diet.	34.3	34.6	44.7	44.4	0.062	1.00	1.00 0.68, 1.46	1.46 0.97, 2.18	1.44 0.84, 2.47

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign, and 75 who did not provide any socioeconomic information.
[2] Numbers responding to items = 730. This includes both those who did not answer the income item nor the knowledge items.
[3] Income – High = AU> $130,000, Middle = AU$72,800 - $129,999, Low-middle = AU$31,200 - $72,799, Low = < AU$31,199.
[4] Adjusted for age and gender.

4.2.2 RELATIONSHIPS BETWEEN SOCIOECONOMIC INDICATORS AND UNDERSTANDING OF THE TERM 'CANCER'

Tables 4.10, 4.11, and 4.12 present the results of linear regression analyses that examine the associations between each SEP indicator (Education, Occupation, and Income) and the overall knowledge score for Cancer, (the Understanding Index). This index ranges from 0 – 5 with higher scores reflecting respondent's greater understanding of the term 'cancer'. To examine confounding, three models that include separate adjustment for age and gender and each SEP indicator are presented. The fourth model adjusts for age and gender and all socioeconomic measures simultaneously. The components of each model are described in the footnotes below each table.

EDUCATION

Table 4.10 presents associations between education and overall understanding of the term 'cancer' (Model 1). Compared to those with a bachelor degree or higher, respondents with no post-school education had significantly lower (p=0.001) mean Understanding Index scores and thus a lower overall understanding of the term 'cancer'. When Model 1 was adjusted separately for occupation in Model 2 (p<0.001), and income in Model 3 (p<0.001), and finally for all socioeconomic measures simultaneously in Model 4, in each case the mean index score for those with no post-school education was significantly lower than the referent group (p<0.001).

Table 4.10 Relationships between Education and the Understanding Index[1] for the term 'Cancer'

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Education	***(n = 841)***															
Bach/ higher	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
Dip/ Ass. Deg.	-0.202	0.10	-0.402, -0.003	**0.047**	-0.168	0.10	-0.372, 0.037	0.109	-0.174	0.11	-0.382, 0.033	0.100	-0.163	0.11	-0.379, 0.053	0.138
Cert/ Trade	-0.195	0.10	-0.383, -0.006	**0.043**	-0.161	0.11	-0.368, 0.046	0.127	-0.185	0.10	-0.387, 0.017	0.073	-0.189	0.11	-0.411, 0.033	0.095
No post-school	-0.337	0.08	-0.492, -0.181	**0.001**	-0.292	0.09	-0.467, -0.118	**0.001**	-0.282	0.09	-0.453, -0.110	**0.001**	-0.313	0.10	-0.502, -0.124	**0.001**
Occupation	***(n = 833)***															
Man. / Prof.					1.00	-	-	-					1.00	-	-	-
White collar					0.054	0.09	-0.118, 0.226	0.537					0.107	0.09	-0.076, 0.291	0.251
Blue collar					-0.116	0.12	-0.346, 0.113	0.319					-0.041	0.12	-0.282, 0.199	0.737
Income	***(n = 727)***															
High									1.00	-	-	-	1.00	-	-	-
Middle									-0.034	0.09	-0.203, 0.136	0.697	-0.027	0.09	-0.197, 0.143	0.755
Low-Middle									-0.084	0.10	-0.271, 0.103	0.377	-0.068	0.10	-0.259, 0.123	0.483
Low									-0.339	0.13	-0.592, -0.085	**0.009**	-0.326	0.14	-0.597, -0.054	**0.019**

[1] Index of 5 knowledge items. Possible score 0-5 (5 indicates high knowledge score).
[2] Model 1 = Education/ Age/ Gender
[3] Model 2 = Education / Occupation/Age/ Gender
[4] Model 3 = Education / Income / Age / Gender
[5] Model 4 = Education / Occupation/ Income/ Age/ Gender
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the multivariable modelling they are a very mixed group, difficult to interpret with confidence or reliability and thus not presented here.

OCCUPATION

Table 4.11 presents results of linear regression analyses that examine the association between occupation and respondents' overall understanding of the term 'cancer'. Model 1 indicates that blue collar workers scored significantly lower (p=0.017) on the Understanding Index for cancer than the referent group Managers/ Professionals. This occupational level difference diminished to non-significance after separate adjustment for household income in Model 2, education in Model 3, and after adjustment for all socioeconomic measures simultaneously in Model 4.

YEARLY HOUSEHOLD INCOME

Table 4.12 presents results of linear regression analysis examining associations between respondents' yearly household income and overall understanding of the term 'cancer'. The mean index scores of respondents with low income level are significantly lower (p=0.001) than the mean scores of those of the high income level referent group. When Model 1 is adjusted for the effects of education (Model 2), the difference in scores remain statistically significant (p=0.009) and similarly when adjusted for occupation (p=0.003) in Model 3, and simultaneously for all socioeconomic measures (p= 0.019) in Model 4.

Table 4.11 Relationships between Occupation and the Understanding Index [1] for the term 'Cancer'

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Occupation (n = 833)																
Man./ Prof.	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
White collar	-0.058	0.08	-0.217, 0.100	0.470	-0.008	0.09	-0.177, 0.161	0.928	0.054	0.09	-0.118, 0.226	0.537	0.107	0.09	-0.076, 0.291	0.251
Blue collar	-0.250	0.11	-0.456, -0.045	**0.017**	-0.175	0.12	-0.392, 0.041	0.112	-0.116	0.12	-0.346, 0.113	0.319	-0.041	0.12	-0.282, 0.199	0.737
Income (n = 727)																
High					1.00	-	-	-					1.00	-	-	-
Middle					-0.062	0.09	-0.231, 0.107	0.470					-0.027	0.09	-0.197, 0.143	0.755
Low-mid					-0.117	0.10	-0.306, 0.072	0.226					-0.068	0.10	-0.259, 0.123	0.483
Low					-0.411	0.14	-0.680, -0.141	**0.003**					-0.326	0.14	-0.597, -0.054	**0.019**
Education (n= 841)																
Bach/ higher									1.00	-	-	-	1.00	-	-	-
Dip/Ass.deg.									-0.168	0.10	-0.372, 0.037	0.109	-0.163	0.11	-0.379, 0.053	0.138
Cert/ Trade									-0.161	0.11	-0.368, 0.046	0.127	-0.189	0.11	-0.411, 0.033	0.095
No post-school									-0.292	0.09	-0.467, -0.118	**0.001**	-0.313	0.10	-0.502, -0.124	**0.001**

[1] Index of 5 knowledge items. Possible score 0-5 (5 indicates high knowledge score).
[2] Model 1 = Occupation/ Age/ Gender.
[3] Model 2 = Occupation / Income/Age/ Gender
[4] Model 3 = Occupation / Education / Age / Gender.
[5] Model 4 = Occupation/ Income/ Education/ Age/ Gender.
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the multivariable modelling they are a very mixed group, difficult to interpret with confidence or reliability and thus not presented here.

Table 4.12 Relationships between yearly household Income and the Understanding Index [1] for the term 'Cancer'

	Model 1				Model 2				Model 3				Model 4			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Income	***(n = 727)***															
High	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
Middle	-0.088	0.09	-0.255, 0.079	0.299	-0.034	0.09	-0.382, 0.033	0.697	-0.062	0.09	-0.231, 0.107	0.470	-0.027	0.09	-0.197, -0.143	0.755
Low-middle	-0.172	0.09	-0.352, - 0.008	0.061	-0.084	0.10	-0.387, 0.017	0.377	-0.117	0.10	-0.306, 0.072	0.226	-0.068	0.10	-0.259, 0.123	0.483
Low	-0.469	0.13	-0.716, -0.223	**0.001**	-0.339	0.13	-0.453, -0.110	**0.009**	-0.411	0.14	-0.680, -0.141	**0.003**	-0.326	0.14	-0.597, -0.054	**0.019**
Education	***(n= 841)***															
Bach./ higher					1.00	-	-	-					1.00	-	-	-
Dip/ Ass .deg.					-0.174	0.11	-0.382, 0.033	0.100					-0.163	0.11	-0.379, 0.053	0.138
Cert/ Trade					-0.185	0.10	-0.387, 0.017	0.073					-0.189	0.11	-0.411, 0.033	0.095
No post-sch.					-0.282	0.09	-0.453, -0.110	**0.001**					-0.313	0.10	-0.502, -0.124	**0.001**
Occupation	***(n = 833)***															
Man./ Prof.									1.00	-	-	-	1.00	-	-	-
White collar									-0.008	0.09	-0.177, 0.161	0.928	0.107	0.10	-0.076, 0.291	0.251
Blue collar									-0.175	0.11	-0.392, 0.041	0.112	-0.041	0.12	-0.282, 0.199	0.737

[1] Index of 5 knowledge items. Possible score 0-5 (5 indicates high knowledge score).
[2] Model 1 = Income/ Age/ Gender.
[3] Model 2 = Income / Education /Age/ Gender.
[4] Model 3 = Income/Occupation/Age/Gender.
[5] Model 4 = Income/ Education/ Occupation/ Age/ Gender
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the multivariable modelling they are a very mixed group, difficult to interpret with confidence or reliability and thus not presented here.

4.2.3 SOCIOECONOMIC POSITION AND KNOWLEDGE AND UNDERSTANDING ABOUT LIFESTYLE RELATED CHRONIC DISEASE (LRCD)

EDUCATION

Table 4.13 examines the association between education level and individual knowledge items about LRCD. Statistically significant bivariate associations were found between education level and knowledge about LRCD and recurrence (p=0.002), quick cure with medication (p=0.001), taking action (p=0.002), possible outcomes (p=0.001), prevention with regular physical activity (p=0.045), risk with increased waistline measurement (p=0.004), risk with limited activity (p=0.003), and risk with less than 2 fruit and 5 vegetables per day (p=0.037). For each of these items except the latter, the highest proportions of incorrect answers were among those with no post-school qualifications.

The results of multivariable analyses show that respondents with the least education are significantly more likely than those with tertiary level education to give an incorrect response to items regarding LRCD and recurrence (OR 2.05; 95% CI 1.39-3.04), quick cure with medication (OR 3.07; 95% CI 1.99-4.74), taking action (OR 1.97; 1.20-3.24), possible outcomes (OR 3.04; 1.67-5.55), risk with increased waistline measurement (OR 2.69; 95% CI 1.51-4.77), risk with limited activity (OR 2.99; 95% CI 1.61-5.57), and risk with less than 2 fruit and 5 vegetables per day (OR 1.59; 95% CI 1.13-2.25).

Table 4.13 Relationships between Education and incorrect knowledge about Lifestyle Related Chronic Disease (LRCD)

	% Incorrect[1,2]					Odds ratio (95% CI)[3]			
Knowledge Item	Bach/ high	Dip/ Ass. Deg.	Cert/ Trade	No post-school	p. value	Bach/ higher	Dip/ Ass. Deg.	Cert/ Trade	No post-school
Knowledge about the condition									
LRCD can last more than 6 months and keep coming back.	18.4	21.6	23.5	31.8	**0.002**	1.00	1.22, 0.72, 2.07	1.37, 0.84, 2.23	**2.05, 1.39, 3.04**
LRCD only occur in the elderly.	5.3	5.2	6.6	10.0`	0.126	1.00	0.98, 0.38, 2.55	1.17, 0.51, 2.72	**1.91, 1.00, 3.63**
LRCD can be quickly cured with medication.	12.5	20.0	21.3	30.0	**0.001**	1.00	1.75, 0.99, 3.08	**1.79, 1.05, 3.04**	**3.07, 1.99, 4.74**
LRCD is too late to do anything about.	9.6	12.2	6.6	18.2	**0.002**	1.00	1.30, 0.66, 2.54	0.61, 0.28, 1.33	**1.97, 1.20, 3.24**
Knowledge about health effects									
LRCD can result in pain, disability or death.	5.3	9.6	6.6	15.6	**0.001**	1.00	1.92, 0.87, 4.24	1.25, 0.54, 2.88	**3.04, 1.67, 5.55**
Knowledge about current risk and prevention									
LRCD can be prevented by regular physical activity.	34.9	30.4	27.9	40.9	**0.045**	1.00	0.82, 0.52, 1.30	0.69, 0.44, 1.08	1.19, 0.84, 1.67
My risk of LRCD would be increased if my waist measurement was greater than 94 cm (males) or 80cm (females).	6.2	11.3	14.5	15.0	**0.004**	1.00	1.91, 0.92, 3.98	**2.47, 1.28, 4.78**	**2.69, 1.51, 4.77**
My risk of LRCD would be decreased if I was physically active for more than 30 minutes each day.	5.0	9.5	10.1	13.8	**0.003**	1.00	2.00, 0.89, 4.44	**2.14, 1.01, 4.53**	**2.99, 1.61, 5.57**
My risk of LRCD would be increased if I regularly ate less than 2 serves of fruit & 5 vegetables each day.	34.2	46.1	42.0	44.2	**0.037**	1.00	**1.64, 1.06, 2.54**	1.35, 0.89, 2.04	**1.59, 1.13, 2.25**
My risk of LRCD would be decreased if I drank mainly water throughout the day.	39.6	40.0	38.4	45.9	0.354	1.00	1.02, 0.66, 1.58	0.93, 0.61, 1.40	1.23, 0.88, 1.72

[1] Population N = 845 excludes 139 respondents who were unaware of the Measure Up campaign, and 75 who did not provide any socioeconomic information.
[2] Number of respondents answering the question ranged 828-835. This includes both those who did not answer the education question nor the knowledge question.
[3] Adjusted for age and gender.

OCCUPATION

Table 4.14 examines relationships between respondent's occupation and knowledge about LRCD. Statistically significant bivariate associations were observed between occupation and knowledge about quick cure with medication (p=0.016), and risk with increased waistline measurement (p=0.001).

Results of multivariable analyses show that respondents with White Collar occupations are significantly more likely than Managers/Professionals to give an incorrect response to the items regarding LRCD and quick cure with medication (OR 1.99; 95% CI 1.29 - 3.08), and risk with less than 2 fruit and 5 vegetables per day (OR 1.43; 95% CI 1.00 - 2.03). Respondents with Blue Collar occupations are significantly more likely than the referent group to incorrectly answer the items regarding risk with increased waistline measurement (OR 3.07; 95% CI 1.59 – 5.90), and risk with less than 30 minutes activity daily (OR 2.16; 95% CI 1.01 – 4.63).

Table 4.14 Relationships between Occupation and incorrect knowledge about Lifestyle Related Chronic Disease

Knowledge Item	% Incorrect[1, 2,3]				Odds ratio: (95% CI)[4]		
	Man/ Profs	White collar	Blue collar	p. value	Man/ Profs	White collar	Blue collar
Knowledge about the condition							
LRCD can last more than 6 months and keep coming back.	19.8	26.2	24.0	0.180	1.00	1.44 0.96, 2.16	1.27 0.75, 2.16
LRCD only occur in the elderly.	4.8	5.8	9.6	0.184	1.00	1.27 0.59, 2.70	1.94 0.85, 4.42
LRCD can be quickly cured with medication.	15.0	24.0	23.1	**0.016**	1.00	**1.99 1.29, 3.08**	1.51 0.88, 2.64
LRCD is too late to do anything about.	9.0	12.3	7.8	0.314	1.00	1.47 0.85, 2.55	0.78 0.35, 1.76
Knowledge about health effects							
LRCD can result in pain, disability or death.	7.1	8.8	9.6	0.616	1.00	1.19 0.63, 2.22	1.40 0.64, 3.05
Knowledge about current risk and prevention							
LRCD can be prevented by regular physical activity.	30.8	35.7	30.8	0.434	1.00	1.23 0.85, 1.77	0.97 0.60, 1.56
Increased risk with waistline measurement greater than 94 cm (male) or 80cm (fem).	6.5	9.6	18.3	**0.001**	1.00	1.61 0.86, 3.00	**3.07 1.59, 5.90**
My risk of LRCD would be decreased if I was physically active for more than 30 minutes each day.	5.7	8.7	11.5	0.100	1.00	1.59 0.82, 3.06	**2.16 1.01, 4.63**
My risk of LRCD would be increased if I regularly ate less than 2 serves of fruit & 5 vegetables each day.	35.6	41.7	47.1	0.073	1.00	**1.43 1.00, 2.03**	1.50 0.96, 2.36
My risk of LRCD would be decreased if I drank mainly water throughout the day.	38.2	43.4	40.8	0.460	1.00	1.22 0.86, 1.72	1.09 0.69, 1.72

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign, and 75 who did not provide any socioeconomic information.
[2] Numbers responding to items ranged from 682-686. This includes both those who did not answer the occupation item nor the knowledge item.
[3] Interpretation of the Not Easily Classified (NEC) category was difficult due to the group heterogeneity and thus excluded from Chi Square analyses. The NEC group includes respondents who were studying, unemployed, permanently unable to work, retired, and engaged in home duties on a full-time basis (see profile Table 3.5).
[4] Adjusted for age and gender.

YEARLY HOUSEHOLD INCOME

Table 4.15 examines relationships between yearly household income and knowledge about LRCD. Statistically significant bivariate associations are observed between respondents' income and taking action in response to LRCD (p=0.004), possible outcomes (p=0.009), prevention with physical activity (p=0.022), risk with increased waistline (p=0.001), and risk with less than 30 minutes physical activity daily (p=0.001). For each of these items the highest proportions of incorrect responses were among those in the lowest income group.

Multivariable results show that compared to high income respondents, those with low income have significantly higher odds of an incorrect response regarding taking action in response to LRCD (OR 2.90; 95% CI 1.42 – 5.92), and risk with less than 30 minutes of physical activity daily (OR 6.94; 95% CI 2.94 to 16.36); however, these latter odds had large confidence intervals. Significantly higher odds of incorrect answers were also found for low-middle income respondents regarding possible LRCD outcomes (OR 2.17; 95% CI 1.05-4.48), risk with increased waistline (OR 0.23; 95% CI 0.11-0.51), and risk with less than 30 minutes of physical activity daily (OR 3.09; 95% CI 1.39-6.85).

Table 4.15 Relationships between Income[1] and incorrect knowledge about Lifestyle Related Chronic Disease

Knowledge Item	% Incorrect[1,2,3] High	Middle	Low middle	Low	p. value	Odds ratio (95% CI)[4] High	Middle	Low middle	Low
Knowledge about the condition									
LRCD can last more than 6 months and keep coming back.	19.7	21.6	21.8	29.2	0.400	1.00	1.11, 0.71, 1.74	1.07, 0.66, 1.73	1.58, 0.86, 2.91
LRCD only occur in the elderly.	5.0	5.6	7.0	8.3	0.689	1.00	1.13, 0.50, 2.55	1.34, 0.59, 3.08	1.61, 0.57, 4.53
LRCD can be quickly cured with medication.	16.7	18.6	19.3	22.2	0.737	1.00	1.19, 0.74, 1.92	1.24, 0.74, 2.07	1.46, 0.75, 2.83
LRCD is too late to do anything about.	9.2	9.1	12.3	23.6	**0.004**	1.00	1.00, 0.53, 1.88	1.35, 0.72, 2.55	**2.90, 1.42, 5.92**
Knowledge about health effects									
LRCD can result in pain, disability or death.	5.4	5.2	12.4	12.5	**0.009**	1.00	0.93, 0.41, 2.08	**2.17, 1.05, 4.48**	2.20, 0.89, 5.45
Knowledge about current risk and prevention									
LRCD can be prevented by regular physical activity.	34.7	30.2	33.9	50.0	**0.022**	1.00	0.79, 0.53, 1.17	0.83, 0.55, 1.27	1.66, 0.96, 2.85
My risk of LRCD would be increased if my waist measurement was > 94cm (male)/ > 80cm fem)	7.5	6.4	13.3	22.2	**0.001**	1.00	**0.26, 0.12, 0.56**	**0.23, 0.11, 0.51**	0.55, 0.28, 1.13
My risk of LRCD would be decreased if I was physically active for more than 30 minutes each day.	4.2	5.2	11.1	22.2	**0.001**	1.00	1.29, 0.55, 3.06	**3.09, 1.39, 6.85**	**6.94, 2.94, 16.36**
My risk of LRCD would be increased if I regularly ate less than 2 serves of fruit & 5 vegetables each day.	40.0	36.9	41.0	51.4	0.185	1.00	0.90, 0.62, 1.30	1.06, 0.71, 1.58	1.63 0.95, 2.79
My risk of LRCD would be decreased if I drank mainly water throughout the day.	41.3	37.9	40.4	49.3	0.400	1.00	0.86, 0.59, 1.25	0.90, 0.60, 1.34	1.29 0.75, 2.20

[1] Total population N = 845 excludes 139 respondents who were unaware of the Measure Up campaign, and 75 who did not provide any socioeconomic information.
[2] Numbers responding to items ranges from 729-733. This includes both those who did not answer the income item nor the knowledge items.
[3] Income AU$: High: > $130,000, Middle: $72,800 - $129,999, Low-middle: $31,200 - $72,799, Low: < $31,199.
[4] Adjusted for age and gender.

4.2.4 RELATIONSHIPS BETWEEN SOCIOECONOMIC INDICATORS AND UNDERSTANDING OF THE TERM 'CHRONIC DISEASE'

EDUCATION

Table 4.16 presents associations between education and overall understanding of the term 'Chronic disease'. Model 1 indicates that compared to those with a bachelor degree or higher, respondents with no post-school education had significantly (p=0.001) lower scores and thus a lower overall understanding of the term. With further separate adjustment for occupation in Model 2 (p<0.001), income in Model 3 (p<0.001), and finally for all socioeconomic measures simultaneously in Model 4, the mean index scores for those with no post-school education remained significantly lower than those of the referent group (p<0.001). Having no post-school education remained an important predictor (p<0.001) of the lowest overall understanding of the term 'chronic disease'.

OCCUPATION

Table 4.17 presents associations between occupation and respondents' overall understanding of the term 'chronic disease'. In Model 1 White collar workers have significantly lower scores than did the referent group Managers/ Professionals. This significant difference between groups diminishes after adjusting separately for income in Model 2, education in Model 3, and simultaneously for all socioeconomic measures in Model 4. Thus there is no significant relationship between respondents' occupation and overall understanding of the term after adjusting for other socioeconomic factors.

Table 4.16 Relationships between Education and the Understanding Index [1] for the term 'Lifestyle Related Chronic Disease'

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value
Education ***(n = 841)***																
Bach./ higher	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
Dip/ Ass.deg.	-0.280	0.23	-0.736, 0.177	0.230	-0.172	0.24	-0.642, 0.298	0.472	-0.401	0.24	-0.863, 0.061	0.089	-0.343	0.25	-0.825, 0.139	0.163
Cert/ Trade	-0.163	0.22	-0.595, 0.268	0.457	-0.053	0.24	-0.528, 0.422	0.827	-0.139	0.23	-0.589, 0.311	0.545	-0.096	0.25	-0.592, 0.400	0.704
No post-sch.	-0.859	0.18	-1.215, -0.503	**0.001**	-0.697	0.20	-1.097, -0.296	**0.001**	-0.772	0.19	-1.154, -0.390	**0.001**	-0.759	0.22	-1.182, -0.336	**0.001**
Occupation[6] ***(n = 833)***																
Man./ Prof.					1.00	-	-	-					1.00	-	-	-
White collar					-0.215	0.20	-0.609, 0.179	0.285					-0.055	0.21	-0.465, 0.355	0.792
Blue collar					-0.201	0.27	-0.727, 0.325	0.453					-0.165	-0.27	-0.702, 0.372	0.546
Income ***(n = 727)***																
High									1.00	-	-	-	1.00	-	-	-
Middle									0.272	0.19	-0.106, 0.650	0.158	0.325	0.19	-0.054, -0.704	0.093
Low-middle									-0.044	0.21	-0.461, 0.373	0.836	0.053	0.22	-0.373, 0.480	0.806
Low									-0.627	0.29	-1.192, -0.06	**0.030**	-0.531	0.31	-1.137, 0.076	0.086

[1] Index of 10 knowledge items. Possible score 0-10 (0 indicates high knowledge score).
[2] Model 1 = Education/ Age/ Gender.
[3] Model 2 = Education / Occupation/ Age/ Gender.
[4] Model 3 = Education / Income/ Age / Gender.
[5] Model 4 = Education/ Occupation/ Income/ Age/ Gender
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the multivariable modelling they are a very mixed group, difficult to interpret with confidence or reliability and thus not presented here.

Table 4.17 Relationships between Occupation and the Understanding Index [1] for the term 'Lifestyle Related Chronic Disease'

		Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]		
	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value
Occupation[6] ***(n = 833)***																
Man. /Prof.	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
White collar	-0.442	0.19	-0.805, -0.079	**0.017**	-0.302	0.19	-0.680, 0.076	0.118	-0.215	0.20	-0.609, 0.179	0.285	-0.055	0.21	-0.465, 0.355	0.792
Blue collar	-0.412	0.24	-0.883, 0.059	0.087	-0.368	0.25	-0.852, 0.116	0.136	-0.201	0.27	-0.727, 0.325	0.453	-0.165	-0.27	-0.702, 0.372	0.546
Income ***(n = 727)***																
High					1.00	-	-	-					1.00	-	-	-
Middle					0.249	0.19	-0.129, 0.626	0.197					0.325	0.19	-0.054, 0.704	0.093
Low- middle					-0.052	0.22	-0.475, 0.370	0.808					0.053	0.22	-0.373, 0.480	0.806
Low					-0.710	0.31	-1.313, 0.108	**0.021**					-0.531	0.31	-1.137, 0.076	0.086
Education ***(n = 841)***																
Bach. / higher									1.00	-	-	-	1.00	-	-	-
Dip. /Ass. Deg.									-0.172	0.24	-0.642, 0.298	0.472	-0.343	0.25	-0.825, 0.139	0.163
Cert. / Trade									-0.053	0.24	-0.528, 0.422	0.827	-0.096	0.25	-0.592, 0.400	0.704
No post-school									-0.697	0.20	-1.097, -0.296	**0.001**	-0.759	0.22	-1.182, -0.336	**0.001**

[1] Index of 10 knowledge items. Possible score 0-10 (10 indicates high knowledge score).
[2] Model 1 = Occupation/ Age/ Gender.
[3] Model 2 = Occupation / Income/Age/ Gender
[4] Model 3 = Occupation / Education / Age / Gender
[5] Model 4 = Occupation/ Income/ Education/ Age/ Gender.
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the multivariable modelling they are a very mixed group, difficult to interpret with confidence or reliability and thus not presented here.

INCOME

Table 4.18 examines relationships between yearly household income and overall understanding of the term 'chronic disease'. Model 1 shows that mean index scores of respondents with low income are significantly lower (p=0.001) than those of the high income referent group. When Model 1 is adjusted for the effects of education (Model 2), the difference in scores remains statistically significant (p=0.030) and similarly when adjusted for occupation (p=0.021) in Model 3. In Model 4, however, respondents' scores adjusted simultaneously for both education and occupation were still much lower than those of the referent group but the difference was no longer statistically significant.

Table 4.18 Relationships between Income and the Understanding index[1] for the term 'Lifestyle Related Chronic Disease'

	Model 1				Model 2				Model 3				Model 4			
	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value
Income								***(n = 841)***								
High	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
Middle	0.149	0.190	-0.224, 0.521	0.434	0.272	0.192	-0.106, 0.650	0.158	0.249	0.19	-0.129, 0.626	0.197	0.325	0.193	-0.054, 0.704	0.093
Low-middle	-0.242	0.205	-0.644, 0.160	0.237	-0.044	0.212	-0.461, 0.373	0.836	-0.052	0.22	-0.475, 0.370	0.808	0.053	0.217	-0.373, 0.480	0.806
Low	-0.912	0.280	-1.462, -0.362	**0.001**	-0.627	0.288	-1.192, -0.062	**0.030**	-0.710	0.31	-1.313, -0.108	**0.021**	-0.531	0.309	-1.137, 0.076	0.086
Education								***(n = 841)***								
Bach./ higher					1.00	-	-	-					1.00	-	-	-
Dip. /Ass. Deg.					-0.401	0.235	-0.863, 0.061	0.089					-0.343	0.245	-0.825, 0.139	0.163
Cert/ Trade					-0.139	0.229	-0.589, 0.311	0.545					-0.096	0.253	-0.592, 0.400	0.704
No post-school					-0.772	0.194	-1.154, -0.390	**0.001**					-0.759	0.215	-1.182, -0.336	**0.001**
Occupation								***(n = 841)***								
Man. / Prof.									1.00	-	-	-	1.00	-	-	-
White collar									-0.302	0.19	-0.680, 0.076	0.118	-0.055	0.209	-0.465, 0.355	0.792
Blue collar									-0.368	0.25	-0.852, 0.116	0.136	-0.165	-0.274	-0.702, 0.372	0.546

[1] Index of 10 knowledge items. Possible score 0-10 (10 indicates high knowledge score).
[2] Model 1 = Income/ Age/ Gender.
[3] Model 2 = Income / Education /Age/ Gender.
[4] Model 3 = Income/Occupation/Age/Gender.
[5] Model 4 = Income/ Education/ Occupation/ Age/ Gender.
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the multivariable modelling they are a very mixed group, difficult to interpret with confidence or reliability and thus not presented here.

4.2.5 SOCIOECONOMIC POSITION AND KNOWLEDGE AND UNDERSTANDING ABOUT TYPE 2 DIABETES

EDUCATION

Table 4.19 examines the association between level of education and knowledge about Type 2 Diabetes. Statistically significant bivariate associations were found between education and knowledge about risk with excess weight around the waist (p=0.001), simply treated by not eating sugar (p=0.018), only affecting the elderly (p=0.016), likelihood of skin cancer (p=0.028), and, prevention with healthy lifestyle (p=0.022). For each of these items, the highest proportions of incorrect responses were for respondents with no post-school qualifications.

The results of multivariable analyses show that respondents with the least education are significantly more likely than those with tertiary level education to give an incorrect response to items regarding risk with excess weight around the waist (OR 2.46, 95% CI 1.53 – 3.94), the disease process regarding insulin (OR 1.76, 95% CI 1.18 – 2.61), treatment by simply not eating sugar (OR 2.02; 95% CI 1.36 – 2.99), only affecting the elderly (OR 2.37; 95% CI 1.24-4.53), the disease process regarding glucose (OR 1.56; 95% CI 1.06 – 2.28), and many conditions which were examined for an increased likelihood in Type 2 Diabetes, such as heart attack (OR 1.47; 95% CI 1.04 – 2.07), skin cancer (OR 1.47; 95% CI 1.04 – 2.08), blindness (OR 1.74; 95% CI 1.16 – 2.60), stroke (OR 1.57; 95% CI 1.11 – 2.22), loss of limb (OR 1.78; 95% CI 1.19 – 2.68), and impotence (OR 1.64 95% CI 1.15 – 2.33).

OCCUPATION

Table 4.20 examines associations between respondents' occupation and knowledge about Type 2 Diabetes indicating no statistically significant bivariate relationships. Results of multivariable analyses show that respondents in White Collar occupations were significantly more likely than Managers/Professionals to give an incorrect response to the item regarding Type 2 Diabetes being easily treated by simply not eating sugar (OR 1.63; 95% CI 1.08 – 2.48).

Table 4.19 Relationships between Education and incorrect knowledge about Type 2 Diabetes (T2D)

Knowledge Item	% Incorrect[1,2] Bach high	Dip/ Ass. Deg.	Cert/ Trade	No post-Sch.	p. value	Odds ratio (95% CI)[3] Bach high	Dip/ Ass. Deg.	Cert/ Trade	No post-school
Knowledge about the condition									
Excess weight around waist increases risk - T2D	10.2	10.4	12.6	21.9	**0.001**	1.00	1.02 0.51, 2.10	1.22 0.65, 2.28	**2.46** **1.53, 3.94**
T2D is a condition that causes there to be too much sugar in the blood.	31.5	33.9	35.6	38.0	0.427	1.00	1.12 0.71, 1.76	1.20 0.78, 1.83	1.34 0.94, 1.90
In T2D the body does not produce enough insulin or it does not work	19.3	25.2	23.7	28.0	0.097	1.00	1.41 0.85, 2.34	1.26 0.77, 2.05	**1.76** **1.18, 2.61**
T2D is a condition that is easily treated by simply not eating sugar.	19.9	24.3	26.9	31.3	**0.018**	1.00	1.29 0.78, 2.16	1.36 0.85, 2.20	**2.02** **1.36, 2.99**
T2D is a condition that only affects the elderly	5.0	13.3	8.2	10.8	**0.016**	1.00	**2.93** **1.39, 6.15**	1.61 0.72, 3.59	**2.37** **1.24, 4.53**
In T2D glucose cannot get from the blood-stream into body cells	68.1	67.3	71.4	77.2	0.080	1.00	0.96 0.61, 1.52	1.12 0.72, 1.76	**1.56** **1.06, 2.28**
Knowledge about health effects									
If a person has T2D they are more likely to experience: Heart attack	34.0	38.3	40.3	41.5	0.271	1.00	1.21 0.77, 1.88	1.35 0.89, 2.05	**1.47** **1.04, 2.07**
Skin cancer	33.5	48.2	39.3	42.0	**0.028**	1.00	**1.85** **1.19, 2.86**	1.21 0.79, 1.84	**1.47** **1.04, 2.08**
Blindness	19.0	28.1	21.5	27.4	0.058	1.00	**1.67** **1.01, 2.76**	1.07 0.65, 1.77	**1.74** **1.16, 2.60**
Stroke	32.2	36.8	41.4	40.5	0.130	1.00	1.23 0.78, 1.92	1.46 0.96, 2.23	**1.57** **1.11, 2.22**
Kidney damage	33.6	35.7	40.0	37.1	0.604	1.00	1.09 0.69, 1.71	1.24 0.81, 1.88	1.23 0.87, 1.75
Loss of limb	19.6	28.7	28.1	26.6	0.073	1.00	**1.68** **1.02, 2.78**	1.53 0.95, 2.48	**1.78** **1.19, 2.68**
Impotence	58.6	59.1	63.4	67.6	0.142	1.00	1.01 0.65, 1.57	1.21 0.79, 1.85	**1.64** **1.15, 2.33**
Knowledge about current risk and prevention									
T2D is preventable by keeping healthy weight, daily physical activity and making good food choices	14.0	26.1	14.2	17.4	**0.022**	1.00	**2.17** **1.28, 3.67**	0.96 0.53, 1.71	1.36 0.86, 2.16

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign, and 75 who did not provide any socioeconomic information.
[2] Number of respondents answering the question ranged 820-831. This includes both those who did not answer either the education question or the knowledge question.
[3] Adjusted for age and gender.

Table 4.20 Relationships between Occupation and incorrect knowledge about Type 2 Diabetes (T2D)

Knowledge Item	% incorrect[1,2,3]				Odds ratio (95% CI)[4]		
	Man/ Prof	White collar	Blue collar	*p. value*	Man/ Prof	White collar	Blue collar
Knowledge about the condition							
Excess weight around waist increases risk - T2D	10.5	12.7	15.5	0.356	1.00	1.29 0.76, 2.20	1.49 0.78, 2.82
T2D is a condition that causes there to be too much sugar in the blood.	31.4	33.9	32.0	0.820	1.00	1.15 0.80, 1.65	1.01 0.63, 1.63
In T2D the body does not produce enough insulin or it doesn't work properly	24.8	23.9	23.3	0.941	1.00	1.06 0.71, 1.58	0.84 0.50, 1.42
T2D is a condition that is easily treated by simply not eating sugar.	20.2	24.8	29.1	0.129	1.00	**1.63** **1.08, 2.48**	1.37 0.82, 2.27
T2D is a condition that only affects the elderly	6.0	8.8	8.8	0.357	1.00	1.75 0.91, 3.35	1.36 0.60, 3.10
In T2D glucose cannot get from the blood-stream into body cells	69.6	73.1	74.3	0.534	1.00	1.21 0.82, 1.77	1.19 0.72, 1.99
Knowledge about health effects							
If a person has T2D they are more likely to experience: Heart attack	36.8	37.3	35.9	0.972	1.00	1.05 0.74, 1.50	0.98 0.62, 1.56
Skin cancer	36.2	38.5	37.9	0.849	1.00	1.23 0.86, 1.76	0.96 0.60, 1.52
Blindness	21.7	23.8	21.4	0.808	1.00	1.38 0.91, 2.09	0.83 0.48, 1.44
Stroke	35.8	36.4	35.3	0.979	1.00	1.14 0.80, 1.64	0.92 0.57, 1.46
Kidney damage	35.6	33.9	41.2	0.442	1.00	1.07 0.74, 1.54	1.11 0.70, 1.76
Loss of limb	22.4	24.1	32.0	0.136	1.00	1.40 0.92, 2.12	1.43 0.87, 2.37
Impotence	60.9	63.1	66.7	0.550	1.00	1.19 0.84, 1.71	1.24 0.77, 1.99
Knowledge about current risk and prevention							
T2D is preventable by keeping healthy weight, daily physical activity and good food choices	16.8	15.9	11.8	0.473	1.00	1.08 0.67, 1.72	0.59 0.30, 1.15

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign, and 75 who did not provide any socioeconomic information.
[2] Respondent numbers responding to items ranged from 673-683. This includes both those who did not answer the occupation item nor the knowledge item.
[3] Interpretation of the Not Easily Classified (NEC) category was difficult due to the group heterogeneity and thus excluded from Chi Square analyses. The NEC group includes respondents who were studying, unemployed, permanently unable to work, retired, and engaged in home duties on a full-time basis (see profile Table 3.5).
[4] Adjusted for age and gender.

YEARLY HOUSEHOLD INCOME

Table 4.21 examines relationships between yearly household income and respondents' knowledge about Type 2 Diabetes. Statistically significant bivariate associations are observed regarding risk of Type 2 Diabetes with excess weight around the waist (p=0.001), and the disease process regarding glucose (p=0.022).

Multivariable results show that compared to high income respondents, those with low incomes have significantly higher odds of an incorrect response regarding excess weight around the waist (OR 3.60; 95% CI 1.85 – 7.02), diabetes causing too much sugar in the blood (OR 1.79; 95% CI 1.03 to 3.12), easily treated by simply not eating sugar (OR 2.39 95% CI 1.31 to 4.34), only affecting the elderly (OR 2.41; 95% CI 1.02 to 5.68), more likely to experience loss of limb (OR 2.33; 95% CI 1.26 to 4.32), impotence (OR 1.83; 95% CI 1.01 to 3.30), and prevention with healthy lifestyle (OR 2.20; 95% CI 1.14 to 4.24).

Table 4.21 Relationships between yearly household Income[1] and incorrect knowledge about Type 2 Diabetes (T2D)

Knowledge Item	**% Incorrect[2,3]**					**Odds ratio (95% CI)[4]**			
	High	Mid	Low mid	Low	p. value	High	Middle	Low mid	Low
Knowledge about the condition									
Excess weight around waist increases risk - T2D	10.3	10.1	14.4	29.2	**0.001**	1.00	0.99 0.54, 1.80	1.45 0.80, 2.63	**3.60 1.85, 7.02**
T2D is a condition that causes there to be too much sugar in the blood.	28.9	32.9	35.8	41.7	0.178	1.00	1.22 0.82, 1.81	1.40 0.92, 2.13	**1.79 1.03, 3.12**
In T2D the body does not produce enough insulin or it doesn't work properly	21.9	23.2	22.5	27.8	0.770	1.00	1.14 0.74, 1.77	1.17 0.73, 1.88	1.52 0.82, 2.79
T2D is a condition that is easily treated by simply not eating sugar.	21.2	21.9	23.5	35.2	0.090	1.00	1.15 0.73, 1.80	1.37 0.85, 2.22	**2.39 1.31, 4.34**
T2D is a condition that only affects the elderly	6.6	6.6	8.6	13.9	0.191	1.00	1.07 0.51, 2.23	1.47 0.70, 3.10	**2.41 1.02, 5.68**
In T2D glucose cannot get from the blood-stream into body cells	67.8	74.0	67.0	84.3	**0.022**	1.00	1.38 0.92, 2.07	0.95 0.62, 1.45	2.66 1.22, 4.10
Knowledge about health effects									
If a person has T2D they are more likely to experience:									
Heart attack	40.7	37.3	32.4	41.7	0.307	1.00	0.86 0.59, 1.25	0.72 0.48, 1.09	1.08 0.63, 1.86
Skin cancer	36.4	33.8	42.8	44.3	0.173	1.00	0.93 0.64, 1.37	1.41 0.94, 2.12	1.47 0.85, 2.55
Blindness	23.1	22.5	19.3	26.8	0.589	1.00	1.04 0.69, 1.61	0.89 0.55, 1.45	1.33 0.71, 2.46
Stroke	37.9	36.1	33.7	35.2	0.841	1.00	0.96 0.66, 1.40	0.93 0.62, 1.41	0.98 0.56, 1.72
Kidney damage	37.3	33.8	33.2	40.8	0.574	1.00	0.91 0.62, 1.33	0.93 0.61, 1.41	1.27 0.73, 2.21
Loss of limb	21.5	22.8	22.3	32.4	0.276	1.00	1.23 0.79, 1.94	1.47 0.90, 2.39	**2.33 1.26, 4.32**
Impotence	61.1	61.7	58.0	71.8	0.240	1.00	1.08 0.74, 1.57	1.02 0.68, 1.52	**1.83 1.01, 3.30**
Knowledge about current risk and prevention									
T2D is preventable by keeping healthy weight, daily physical activity and making good food choices	14.9	13.2	16.6	25.4	0.100	1.00	0.93 0.55, 1.57	1.34 0.78, 2.30	**2.20 1.14, 4.24**

[1] Income AU$: High: > $130,000, Mid: $72,800 - $129,999, Low-mid: $31,200 - $72,799, Low: < $31,199.
[2] Total population N = 845 excludes 139 respondents who were unaware of the Measure Up campaign, and 75 who did not provide any socioeconomic information.
[3] Number of respondents who answered each question ranged from 721-730. This includes both those who did not answer the income question nor the knowledge items.
[4] Adjusted for age and gender.

4.2.6 RELATIONSHIPS BETWEEN SOCIOECONOMIC INDICATORS AND UNDERSTANDING OF THE TERM 'TYPE 2 DIABETES'

EDUCATION

Table 4.22 presents associations between education and mean understanding index scores that indicate an overall understanding of the term 'Type 2 Diabetes' (Model 1). Compared to those with a bachelor degree or higher, respondents with no post-school education had significantly lower (p=0.001) scores and thus a lower overall understanding of the term. After adjustment for occupation in Model 2 (p<0.001), income in Model 3 (p<0.001), and for all socioeconomic measures simultaneously in Model 4 (p<0.001), the mean index scores for those with no post-school education are significantly lower from those of the referent group.

As well, when Model 1 was adjusted for the effects of Occupation (Model 2), a statistically significant difference (p=0.048) was observed between the mean index scores of respondents who have Diploma or Associate degree level of education and scores of the referent group. When the model was adjusted for Income, however, the statistical significance of the difference diminished but was regained when the model was adjusted for all socioeconomic measures simultaneously in Model 4 (p=0.047).

OCCUPATION

Table 4.23 presents associations between occupation and respondents' overall understanding of the term 'Type 2 Diabetes'. In Model 1 Blue collar worker mean scores are lower than the scores of the Managers/ Professionals referent group but the difference does not reach statistical significance. Similarly, when the model is adjusted separately for Income and Education and finally for all socioeconomic measures, there is no significant difference in mean Understanding Index scores between occupational levels.

Table 4.22 Relationships between Education and the Understanding index[1] for the term Type 2 Diabetes

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Education									***(n = 841)***							
Bach./ higher	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
Dip/ Assoc. Deg.	-0.711	0.37	-1.444, 0.022	0.057	-0.765	0.39	-1.525 - -0.006	**0.048**	-0.750	0.39	-1.513, 0.014	0.054	-0.810	0.41	-1.610, -0.010	**0.047**
Cert/ Trade	-0.655	0.35	-1.348, 0.038	0.064	-0.745	0.39	-1.513 – 0.023	0.057	-0.504	0.38	-1.248, 0.241	0.184	-0.690	0.42	-1.513, 0.133	0.100
No post-school	-1.197	0.29	-1.768, -0.626	**0.001**	-1.228	0.33	-1.875 - -0.580	**0.001**	-1.110	0.32	-1.741, -0.479	**0.001**	-1.223	0.36	-1.925, -0.521	**0.001**
Occupation									***(n = 841)***							
Man. / Prof.					1.00	-	-	-					1.00	-	-	-
White collar					0.070	0.01	-0.567 – 0.708	0.829					-0.046	0.35	-0.727, 0.634	0.894
Blue collar					0.447	0.04	-0.403 – 1.298	0.302					0.431	0.45	-0.461, 1.322	0.343
Income									***(n = 841)***							
High									1.00	-	-	-	1.00	-	-	-
Middle									-0.087	0.32	-0.711, 0.537	0.785	-0.080	0.32	-0.709, 0.549	0.802
Low-Middle									-0.059	0.35	-0.748, 0.630	0.867	-0.007	0.36	-0.715, 0.701	0.985
Low									-1.032	0.48	-1.966, -0.097	**0.030**	-1.064	0.51	-2.071, -0.057	**0.038**

[1] Index of 14 knowledge items. Possible score 0-14 (14 indicates high score).
[2] Model 1 = Education/ Age/ Gender.
[3] Model 2 = Education / Occupation/ Age/ Gender.
[4] Model 3 = Education/ Income/ Age/ Gender.
[5] Model 4 = Education/ Income/ Occupation/ Age/ Gender.
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the modelling they are a mixed group, difficult to interpret with confidence or reliability and thus not presented here.

Table 4.23 Relationships between Occupation and the Understanding Index[1] for the term Type 2 Diabetes

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Occupation								***(n = 841)***								
Man./ Prof.	1.00	-	-	-	1.00	-	-	-	100	-	-	-	1.00	-	-	-
White collar	-0.409	0.299	-0.995 , 0.177	0.171	-0.511	0.319	-1.137, 0.115	0.110	0.070	0.31	-0.567, 0.708	0.829	-0.046	0.347	-0.727, 0.634	0.894
Blue collar	-0.151	0.387	-0.911, 0.609	0.697	-0.096	0.408	-0.897, 0.706	0.815	0.447	0.43	-0.403, 1.298	0.302	0.431	0.454	-0.461 , 1.322	0.343
Income								***(n = 841)***								
High					1.00	-	-	-					1.00	-	-	-
Middle					-0.216	0.318	-0.841, 0.408	0.497					-0.080	0.320	-0.709 , 0.549	0.802
Low-middle					-0.185	0.357	-0.885, 0.515	0.604					-0.007	0.361	-0.715, 0.701	0.985
Low					-1.312	0.508	-2.309, -0.315	**0.010**					-1.064	0.513	-2.071, -0.057	**0.038**
Education								***(n = 841)***								
Bach. / higher									1.00	-	-	-	1.00	-	-	-
Dip./Ass. Deg.									-0.765	0.39	-1.525, -0.006	**0.048**	-0.810	0.407	-1.610, -0.010	**0.047**
Cert. / Trade									-0.745	0.39	-1.513, 0.023	0.057	-0.690	0.419	-1.513, 0.133	0.100
No post-school									-1.228	0.33	-1.875, -0.580	**0.001**	-1.223	0.358	-1.925, -0.521	**0.001**

[1] Index of 14 knowledge items. Possible score 0-14 (14 indicates high score).
[2] Model 1 = Occupation/ Age/ Gender.
[3] Model 2 = Occupation / Income/Age/ Gender
[4] Model 3 = Occupation / Education / Age / Gender.
[5] Model 4 = Occupation/ Income/ Education/ Age/ Gender.
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the modelling they are a mixed group, difficult to interpret with confidence or reliability and thus not presented here.

YEARLY HOUSEHOLD INCOME

Table 4.24 examines relationships between yearly household income and overall understanding of the term ‘Type 2 Diabetes’. Model 1 shows mean index scores of respondents with low income significantly lower (p=0.002) than those of the high income referent group. When Model 1 is adjusted for the effects of education (Model 2), the difference in scores remains statistically significant (p=0.030) and similarly when adjusted for occupation (p=0.010) in Model 3, and simultaneously for all socioeconomic measures in Model 4 (p=0.038).

Table 4.24 Relationships between Income and the Understanding index[1] for the term Type 2 Diabetes

	Model 1				Model 2				Model 3				Model 4			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Income				***(n = 727)***												
High	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
Middle	-0.283	0.313	-0.897, 0.331	0.366	-0.087	0.318	-0.711 , 0.537	0.785	-0.216	0.32	-0.841, 0.408	0.497	-0.080	0.320	-0.709, 0.549	0.802
Low-middle	-0.368	0.337	-1.030, 0.294	0.275	-0.059	0.351	-0.748, 0.630	0.867	-0.185	0.36	-0.885, 0.515	0.604	-0.007	0.361	-0.715, 0.701	0.985
Low	-1.437	0.461	-2.342, -0.531	**0.002**	-1.032	0.476	-1.966 , -0.097	**0.030**	-1.312	0.51	-2.309, -0.315	**0.010**	-1.064	0.513	-2.071, -0.057	**0.038**
Education				***(n = 841)***												
Bach/ higher					1.00	-	-	-					1.00	-	-	-
Dip/Ass. Deg.					-0.750	0.389	-1.513, 0.014	0.054					-0.810	0.407	-1.610, -0.010	**0.047**
Cert/ Trade					-0.504	0.379	-1.248, 0.241	0.184					-0.690	0.419	-1.513, 0.133	0.100
No post-school					-1.110	0.321	-1.741, 0.479	**0.001**					-1.223	0.358	-1.925, -0.521	**0.001**
Occupation				***(n = 833)***												
Man./ Prof.									1.00	-	-	-	1.00	-	-	-
White collar									-0.511	0.32	-1.137, 0.115	0.110	-0.046	0.347	-0.727, 0.634	0.894
Blue collar									-0.096	0.41	-0.897, 0.706	0.815	0.431	0.454	-0.461, 1.322	0.343

[1] Index of 14 knowledge items. Possible score 0-14 (14 indicates high score).
[2] Model 1 = Income/ Age/ Gender.
[3] Model 2 = Income / Education /Age/ Gender.
[4] Model 3 = Income/Occupation/Age/Gender.
[5] Model 4 = Income/ Education/ Occupation/ Age/ Gender
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the modelling they are a mixed group, difficult to interpret with confidence or reliability and thus not presented here.

4.2.7 SOCIOECONOMIC POSITION AND KNOWLEDGE AND UNDERSTANDING ABOUT HEART DISEASE

EDUCATION

Table 4.25 examines the association between level of education and knowledge about Heart Disease. Statistically significant bivariate associations were found between education and knowledge about Heart Disease regarding blocked blood vessels (p=0.001), development of the disease over time (p=0.006), the first sign may be angina (p=0.019), cure by medications that thin the blood (p=0.001), heart attack outcomes (p=0.006), and risk should one's parent die of heart attack (p=0.016). With the exception of the item regarding medication, for each of these items the highest proportions of incorrect responses were those of respondents with no post-school qualifications.

The results of multivariable analyses show that respondents with the least education are significantly more likely than those with tertiary level education to give an incorrect response to items regarding; alternative names for heart disease (OR 1.76; 95% CI 1.07-2.92), blocked blood vessels (OR 1.99; 95% CI 1.42-2.79), development of the disease over time (OR 2.97; 95% CI 1.54-5.75), the first sign may be angina (OR 1.89; 95% CI 1.21-2.97), part of the heart muscle dies in heart attack (OR 1.50; 95% CI 1.05-2.15), cure by medications that thin the blood (OR 2.16; 95% CI 1.53-3.04), heart attack outcomes (OR 2.74; 95% CI 1.40-5.38), and risk should one's parent die of heart attack (OR 1.81; 95% CI 1.23-2.65). For the item regarding higher risk for heart disease if a parent had a heart attack, respondents with Certificate/ Trade levels of education (OR 1.75; 95% CI 1.10-2.77) also were significantly more likely than the referent group to give incorrect responses.

Table 4.25 Relationships between Education and incorrect knowledge about Heart Disease

Knowledge Item	% Incorrect[1,2] Bach/ high	Dip/Ass Degree	Cert/ Trade	No post-sch.	p. value	Odds ratio (95% CI)[3] Bach high	Dip/ Ass Degree	Cert/ Trade	No post-school
Knowledge about the condition									
Heart disease is also known as coronary heart disease or coronary artery disease	9.6	11.4	13.3	16.5	0.092	1.00	1.20 0.60, 2.40	1.33 0.71, 2.48	**1.76** **1.07, 2.92**
In heart disease blood vessels to the lungs become blocked making it hard to breathe	41.6	48.2	49.3	59.8	**0.001**	1.00	1.32 0.86, 2.03	1.38 0.91, 2.07	**1.99** **1.42, 2.79**
Heart disease develops over time with gradual blocking of one or more blood vessels that feed the heart muscle.	4.3	7.9	8.2	12.3	**0.006**	1.00	1.89 0.80, 4.50	1.99 0.88, 4.53	**2.97** **1.54, 5.75**
Heart disease may first show as heart pain or angina.	12.5	21.1	18.5	21.9	**0.019**	1.00	1.86 1.07, 3.26	1.59 0.92, 2.76	**1.89** **1.21, 2.97**
Heart attack is a severe form of heart disease in which part of the heart muscle dies	27.8	29.8	35.8	35.9	0.136	1.00	1.10 0.69, 1.77	1.53 0.99, 2.36	**1.50** **1.05, 2.15**
Heart attack can be cured by medications that thin the blood	47.0	55.7	54.5	34.2	**0.001**	1.00	1.41 0.92, 2.17	1.33 0.88, 1.99	**2.16** **1.53, 3.04**
Knowledge about health effects									
Heart attack can lead to long term disability or death	4.3	3.5	5.2	10.8	**0.006**	1.00	0.80 0.26, 2.47	1.30 0.51, 3.32	**2.74** **1.40, 5.38**
Knowledge about current risk and prevention									
Heart attack is preventable by daily physical activity, healthy food, and keeping weight down	17.7	16.7	12.8	17.7	0.599	1.00	0.94 0.53, 1.66	0.67 0.37, 1.20	0.94 0.61, 1.46
I would consider myself at risk for heart disease if one of my parents were to die from heart attack.	20.5	21.7	30.6	30.5	**0.016**	1.00	1.08 0.64, 1.81	**1.75** **1.10, 2.77**	**1.81** **1.23, 2.65**

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign, and 75 who did not provide any socioeconomic information.
[2] Number of respondents answering the question ranged 827-832. This includes both those who did not answer the education question nor the knowledge question.
[3] Adjusted for age and gender

OCCUPATION

Table 4.26 examines associations between respondents' occupation and knowledge about Heart Disease. Statistically significant bivariate associations are observed between respondents' occupation and knowledge about which blood vessels become blocked in heart disease (p=0.002), cure by medications that thin the blood (p=0.048), and risk of heart disease with parental heart attack (p=0.005).

Results of multivariable analyses show that respondents with Blue Collar occupations are significantly more likely than Managers/Professionals to give an incorrect response to items regarding blood vessels blocked in heart disease (OR 1.76; 95% CI 1.12 – 2.75), part of the heart muscle dying in heart attack (OR 1.64; 95% CI 1.02 – 2.64), and risk of heart disease with parental heart attack (OR 2.19; 95% CI 1.33 – 3.60). Odds for White collar workers were also significantly higher than those of the referent group for items regarding vessels blocked in heart disease (OR 1.69; 95% CI 1.19 – 2.38), gradual blocking of vessels over time (OR 2.09; 95% CI 1.05 – 4.16), cure by medications that thin the blood (OR 1.58; 95% CI 1.12–2.23), and risk of heart disease with parental heart attack (OR 1.55; 95% CI 1.03 – 2.33).

Table 4.26 Relationships between Occupation and incorrect knowledge about Heart Disease

Knowledge Item	% incorrect[1,2,3] Man/ Profs	White collar	Blue collar	p.value	Odds ratio (95% CI)[4] Man/ Profs	White collar	Blue collar
Knowledge about the condition							
Heart disease is also known as coronary heart disease or coronary artery disease	9.4	12.3	15.5	0.186	1.00	1.43 0.83, 2.48	1.59 0.83, 3.05
In heart disease blood vessels to the lungs become blocked making it hard to breathe	40.7	54.6	54.4	**0.002**	1.00	**1.69** **1.19, 2.38**	**1.76** **1.12, 2.75**
Heart disease develops over time with gradual blocking of one or more blood vessels that feed the heart muscle	4.5	9.2	8.7	0.062	1.00	**2.09** **1.05, 4.16**	2.01 0.85, 4.74
Heart disease may first show as heart pain or angina	15.8	17.1	21.4	0.414	1.00	1.04 0.66, 1.64	1.50 0.86, 2.63
Heart attack is a severe form of heart disease in which part of the heart muscle dies	27.9	33.2	37.3	0.141	1.00	1.25 0.61, 1.81	**1.64** **1.02, 2.64**
Heart attack can be cured by medications that thin the blood	49.3	59.7	54.4	**0.048**	1.00	**1.58** **1.12, 2.23**	1.17 0.75, 1.83
Knowledge about health effects							
Heart attack can lead to long term disability or death	5.7	7.5	3.9	0.419	1.00	1.28 0.64, 2.53	0.73 0.24, 2.21
Knowledge about current risk and prevention							
Heart attack is preventable by daily physical activity, healthy food, and keeping weight down	16.5	15.4	9.8	0.251	1.00	0.91 0.57, 1.46	0.54 0.26, 1.11
I would consider myself at risk for heart disease if one of my parents were to die from heart attack.	18.8	25.4	33.3	**0.005**	1.00	**1.55** **1.03, 2.33**	**2.19** **1.33, 3.60**

[1] Total population N = 845 excludes 139 respondents who were unaware of the Measure Up campaign, and 75 who did not provide any socioeconomic information.
[2] Numbers responding to items ranged from 679-683. This includes both those who did not answer the occupation item nor the knowledge item.
[3] Interpretation of the Not Easily Classified (NEC) category was difficult due to the group heterogeneity and thus excluded from Chi Square analyses. The NEC group includes respondents who were studying, unemployed, permanently unable to work, retired, and engaged in home duties on a full-time basis (see profile Table 3.5).
[4] Adjusted for age and gender.

INCOME

Table 4.27 examines relationships between yearly household Income and respondents' knowledge about Heart Disease. Statistically significant bivariate associations are observed for items regarding which blood vessels become blocked in heart disease (p=0.006), the gradual blocking of vessels over time (p=0.001), part of heart muscle dying in heart attack (p=0.074), cure with medications that thin the blood (p=0.025), and heart attack outcomes (p=0.002).

Multivariable results show that compared to high income respondents, those with low income have significantly higher odds of an incorrect response regarding which blood vessels become blocked in heart disease (OR 1.97; 95% CI 1.14 – 3.38), the gradual blocking of vessels over time (OR 5.67; 95% CI 2.39 to 13.46), heart pain or angina (OR 2.15 95% CI 1.12 - 4.11), part of heart muscle dying in heart attack (OR 1.90; 95% CI 1.08 - 3.35), heart attack outcomes (OR 4.42; 95% CI 1.76 to 11.10), prevention with healthy lifestyle choices (OR 2.07; 95% CI 1.09 to 3.92), and risk of heart disease with parental heart attack (OR 2.00; 95% CI 1.11 to 3.60). In two items, one regarding blocking of vessels that feed the heart muscle and the other regarding heart attack leading to long term disability, the confidence interval for each odds ratio is wide.

Table 4.27 Relationships between Income[1] and incorrect knowledge about Heart Disease

Knowledge Item	% Incorrect[2,3] High	Mid	Low-mid	Low	p. value	Odds ratio (95% CI)[4] High	Middle	Low-mid	Low
Knowledge about the condition									
Heart disease is also known as coronary heart disease or coronary artery disease	9.1	11.0	13.4	16.7	0.265	1.00	0.50 0.23, 1.10	0.65 0.31, 1.40	0.80 0.38, 1.72
In heart disease blood vessels to the lungs become blocked making it hard to breathe	41.5	44.7	54.8	59.7	**0.006**	1.00	1.12 0.78, 1.62	**1.61** **1.09, 2.40**	**1.97** **1.14, 3.38**
Heart disease develops over time with gradual blocking of one or more blood vessels that feed the heart muscle.	4.1	6.1	7.0	20.8	**0.001**	1.00	1.51 0.66, 3.49	1.61 0.68, 3.81	**5.67** **2.39, 13.46**
Heart disease may first show as heart pain or angina.	13.8	16.7	16.0	26.4	0.091	1.00	1.24 0.74, 2.06	1.13 0.65, 1.96	**2.15** **1.12, 4.11**
Heart attack is a severe form of heart disease in which part of the heart muscle dies	25.4	35.1	30.5	38.0	**0.074**	1.00	1.59 1.07, 2.37	1.35 0.87, 2.09	**1.90** **1.08, 3.35**
Heart attack can be cured by medications that thin the blood	48.3	52.6	62.6	58.3	**0.025**	1.00	1.20 0.83, 1.72	**1.78** **1.20, 2.66**	1.48 0.87, 2.54
Knowledge about health effects									
Heart attack can lead to long term disability or death	4.1	4.8	4.3	15.3	**0.002**	1.00	1.16 0.48, 2.79	1.03 0.39, 2.70	**4.42** **1.76, 11.10**
Knowledge about current risk and prevention									
Heart attack is preventable by daily physical activity, healthy food, and keeping weight down	14.5	15.0	16.5	27.8	0.051	1.00	1.02 0.61, 1.70	1.03 0.60, 1.77	**2.07** **1.09, 3.92**
I would consider myself at risk for heart disease if one of my parents were to die from heart attack.	21.5	24.2	23.9	33.8	0.208	1.00	1.20 0.78, 1.85	1.23 0.77, 1.96	**2.00** **1.11, 3.60**

1 Yearly household Income – High = AU> $130,000, Middle = AU$72,800 - $129,999, Low-middle = AU$31,200 - $72,799, Low = < AU$31,199.
2 Total population N = 845 excludes 139 respondents who were unaware of the Measure Up campaign, and 75 who did not provide any socioeconomic information.
3 N = Number of respondents answering the question ranges 726-730. This includes both those who did not answer the income question nor the knowledge items.
4 Adjusted for age and gender.

4.2.8 RELATIONSHIPS BETWEEN SOCIOECONOMIC INDICATORS AND UNDERSTANDING OF THE TERM ' HEART DISEASE'

EDUCATION

Table 4.28 presents associations between education and mean understanding index scores (Model 1) that indicate an overall understanding of the term 'Heart Disease'. Compared to those with a bachelor degree or higher, respondents with no post-school education (p=0.001), and those with Certificate/ Trade levels of education (p=0.007) had significantly lower scores and thus a lower overall understanding of the term. The mean index scores of respondents with no post-school education maintained a statistically significant difference from the higher educated referent group after adjustment for occupation in Model 2 (p<0.001), income in Model 3 (p<0.001), and finally for all socioeconomic measures simultaneously in Model 4 (p=0.002). The difference in mean scores of those with Certificate/ Trade levels of education, however, lost significance when adjusted for occupation in Model 2, regained significance with adjustment for income in Model 3, but lost significance when adjusted simultaneously for all socioeconomic measures. Having no post-school education remains an important predictor (p<0.002) of the lowest overall understanding of the term 'Heart Disease'.

OCCUPATION

Table 4.29 presents associations between occupation and respondents' overall understanding of the term 'Heart Disease'. In Model 1 both Blue Collar workers (p=0.013) and White collar workers (p=0.022) have significantly lower Understanding Index scores than do the referent group Managers/ Professionals. For both groups of respondents the difference from the referent group diminishes after separate adjustment for Income in Model 2, Education in Model 3 and simultaneously for all socioeconomic measures in Model 4.

Table 4.28 Relationships between Education and the Understanding Index[1] for the term Heart Disease

Total N = 845	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Education	***(n= 841)***															
Bach/ higher	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
Dip/Ass. Degree	-0.300	0.201	-0.694, 0.094	0.135	-0.205	0.207	-0.612, 0.202	0.323	-0.138	0.21	-0.545, 0.270	0.507	-0.019	0.217	-0.529, 0.325	0.640
Cert/ Trade	-0.511	0.190	-0.883, -0.139	**0.007**	-0.390	0.210	-0.801, 0.022	0.064	-0.399	0.20	-0.796, -0.002	**0.049**	-0.082	0.224	-0.846, 0.033	0.070
No post-sch.	-0.781	0.156	-1.088, -0.474	**0.001**	-0.633	0.177	-0.980, -0.286	**0.001**	-0.597	0.17	-0.934, -0.261	**0.001**	-0.150	0.191	-0.977, -0.227	**0.002**
Occupation[6]	***(n = 833)***															
Man. / Prof.					1.00	-	-	-					1.00	-	-	-
White collar					-0.132	0.174	-0.474, 0.209	0.448					-0.001	0.185	-0.367, 0.359	0.982
Blue collar					-0.204	0.232	-0.660, 0.252	0.381					-0.001	0.242	-0.482, 0.469	0.979
Income	***(n= 727)***															
High									1.00	-	-	-	1.00	-	-	-
Middle									-0.286	0.17	-0.619, 0.047	0.093	-0.069	0.171	-0.608, 0.064	0.112
Low-Middle									-0.327	0.19	-0.694, 0.041	0.081	-0.070	0.193	-0.669, 0.087	0.131
Low									-0.904	0.25	-1.402, -0.405	**0.001**	-0.140	0.274	-1.417, -0.342	**0.001**

[1] Index of 9 knowledge items. Possible score 0-9 (9 indicates high knowledge score).
[2] Model 1 = Education/ Age/ Gender
[3] Model 2 = Education / Income/Age/ Gender
[4] Model 3 = Education / Occupation / Age / Gender[5] Model 4 = Education / Income/ Occupation/ Age/ Gender
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the modelling they are a mixed group, difficult to interpret with confidence or reliability and thus not presented here.

Table 4.29 Relationships between Occupational and the Understanding Index[1] for the term Heart Disease

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Occupation[6]	***(n = 833)***															
Man./ Prof.	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
White collar	-0.367	0.16	-0.681, -0.053	**0.022**	-0.211	0.17	-0.545, 0.123	0.216	-0.132	0.17	-0.474, 0.209	0.448	-0.004	0.19	-0.367, 0.359	0.982
Blue collar	-0.516	0.21	-0.924, -0.108	**0.013**	-0.286	0.22	-0.714, 0.141	0.189	-0.204	0.23	-0.660, 0.252	0.381	-0.007	0.24	-0.482, 0.469	0.979
Income	***(n= 727)***															
High					1.00	-	-	-					1.00	-	-	-
Middle					-0.340	0.17	-0.674, -0.007	**0.045**					-0.272	0.17	-0.608, 0.064	0.112
Low-middle					-0.398	0.19	-0.772, -0.025	**0.037**					-0.291	0.19	-0.669, 0.087	0.131
Low					-1.002	0.27	-1.534, -0.470	**0.001**					-0.879	0.27	-1.417, -0.342	**0.001**
Education	***(n= 841)***															
Bach./ higher									1.00	-	-	-	1.00	-	-	-
Dip. /Ass. Deg.									-0.205	0.21	-0.612, 0.202	0.323	-0.102	0.22	-0.529, 0.325	0.640
Cert/ Trade									-0.390	0.21	-0.801, 0.022	0.064	-0.406	0.22	-0.846, 0.033	**0.070**
No post-school									-0.633	0.18	-0.980, -0.286	**0.001**	-0.602	0.19	-0.977, -0.227	**0.002**

[1] Index of 9 knowledge items. Possible score 0-9 (9 indicates high knowledge score).
[2] Model 1 = Occupation/ Age/ Gender.
[3] Model 2 = Occupation / Income/Age/ Gender
[4] Model 3 = Occupation / Education / Age / Gender
[5] Model 4 = Occupation/ Income/ Education/ Age/ Gender.
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the modelling they are a mixed group, difficult to interpret with confidence or reliability and thus not presented here.

YEARLY HOUSEHOLD INCOME

Table 4.30 examines relationships between yearly household income and overall understanding of the term 'Heart Disease'. Model 1 shows mean index scores of respondents with low (p=0.001), low-middle (p=0.004), and middle (p=0.018) income levels are significantly lower than those of the high income referent group. When Model 1 is adjusted for the effects of education (Model 2), the difference in scores remains statistically significant only for the low income group (p=0.001), but with adjustment for Occupation in Model 3 the differences in all groups from the referent group are again significant. When the Income model is adjusted simultaneously for all socioeconomic measures in Model 4, only respondents with low income have significantly lower scores than do the respondents in the referent group (p=0.001) for overall understanding of the term 'Heart Disease'.

Table 4.30 Relationships between Income and the Understanding index[1] for the term Heart Disease

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Income	***(n= 727)***															
High	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
Middle	-0.397	0.167	-0.724, -0.070	**0.018**	-0.286	0.170	-0.619, 0.047	0.093	-0.340	0.17	-0.674, -0.007	**0.045**	-0.272	0.171	-0.608, 0.064	0.112
Low-middle	-0.516	0.180	-0.869, -0.163	**0.004**	-0.327	0.187	-0.694, 0.041	0.081	-0.398	0.19	-0.772, -0.025	**0.037**	-0.291	0.193	-0.669, 0.087	0.131
Low	-1.118	0.246	-1.601, -0.635	**0.001**	-0.904	0.254	-1.402, -0.405	**0.001**	-1.002	0.27	-1.534, -0.470	**0.001**	-0.879	0.274	-1.417, -0.342	**0.001**
Education	***(n= 841)***															
Bach./ higher					1.00	-	-	-					1.00	-	-	-
Dip/ Ass. Deg.					-0.138	0.207	-0.545, 0.270	0.507					-0.102	0.217	-0.529, 0.325	0.640
Cert/ Trade					-0.339	0.202	-0.796, -0.002	0.049					-0.406	0.224	-0.846, 0.033	**0.070**
No post-school					-0.597	0.171	-0.934, -0.261	**0.001**					-0.602	0.191	-0.977, -0.227	**0.002**
Occupation[6]	***(n = 833)***															
Man./ Prof.									1.00	-	-	-	1.00	-	-	-
White collar									-0.211	0.17	-0.545, 0.123	0.216	-0.004	0.185	-0.367, 0.359	0.982
Blue collar									-0.286	0.22	-0.714, 0.141	0.189	-0.007	0.242	-0.482, 0.469	0.979

[1] Index of 9 knowledge items. Possible score 0-9 (9 indicates high knowledge score).
[2] Model 1 = Income/ Age/ Gender.
[3] Model 2 = Income / Education /Age/ Gender.
[4] Model 3 =Income/Occupation/Age/Gender.
[5] Model 4 =Income/ Education/ Occupation/ Age/ Gender.
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the modelling they are a mixed group, difficult to interpret with confidence or reliability and thus not presented here.

4.2.9 SOCIOECONOMIC POSITION AND KNOWLEDGE AND UNDERSTANDING ABOUT OVERWEIGHT.

EDUCATION

Table 4.31 examines the association between level of education and knowledge about Overweight. Statistically significant bivariate associations were found between education and knowledge about Overweight and increased risk of breast (p=0.001) and bowel (p=0.002) cancer; and knowledge about large waistline and too much fat in the abdomen (p=0.029), and energy imbalance (p=0.001). For each of these items the highest proportions of incorrect responses were among those respondents with Certificate / Trade levels of education or no post-school qualifications.

The results of multivariable analyses show that respondents with the least education are significantly more likely than those with tertiary level education to give an incorrect response to items about overweight and increased risk of breast cancer (OR 3.07; 95% CI 2.04-4.62), prostate cancer (OR 1.74; 95% CI 1.14-2.66), bowel cancer (OR 1.84; 95% CI 1.30-2.59), overweight and energy imbalance (OR 3.71; 95% CI 2.29-6.01), fat coating internal organs (OR 1.77; 95% CI 1.18-2.64), and prevention of overweight by eating less snack and takeaway foods (OR 2.29; 95% CI 1.21-4.30).

Respondents with Certificate/ Trade levels of education also had significantly higher odds of having an incorrect response than did respondents in the referent group of having incorrect responses to items regarding overweight and risk of breast cancer (OR 1.70; 95% CI 1.06-2.72) and bowel cancer (OR 1.72; 95% CI 1.13-2.61); and large waistline and too much fat in the abdomen (OR 1.67; 95% CI 1.09-2.55), and energy imbalance (OR 2.10; 95% CI 1.15-3.83).

Respondents who had Diploma or Associate degree levels of education also had significantly higher odds of having an incorrect response than did respondents in the referent group for the items regarding breast cancer (OR 1.85; 95% CI 1.13-3.04), and energy imbalance (OR 2.79; 95% CI 1.54-5.05).

Table 4.31 Relationships between Education and incorrect knowledge about Overweight

Knowledge Item	% Incorrect[1,2] Bach/ high	Dip/ Ass Deg.	Cert/Trade	No post sch.	p. value	Odds ratio (95% CI)[3] Bach/ high	Dip / Ass. Degree	Cert / Trade	No post-school
Knowledge about current risk and prevention									
Excess weight increases risk of:-									
Skin cancer	20.9	26.7	22.8	22.9	0.646	1.00	1.38 0.84, 2.25	1.09 0.67, 1.78	1.18 0.79, 1.76
Breast cancer (post menopause)	63.4	75.9	76.6	82.1	**0.001**	1.00	**1.85 1.13, 3.04**	**1.70 1.06, 2.72**	**3.07 2.04, 4.62**
Prostate cancer	75.4	75.0	80.1	84.0	0.054	1.00	0.98 0.60, 1.60	1.30 0.79, 2.13	**1.74 1.14, 2.66**
Leukaemia	50.9	53.4	43.4	47.5	0.340	1.00	1.10 0.72, 1.69	0.67 0.45, 1.01	0.90 0.64, 1.25
Bowel cancer	52.0	61.2	66.2	65.8	**0.002**	1.00	1.45 0.94, 2.25	**1.72 1.13, 2.61**	**1.84 1.30, 2.59**
Knowledge about the condition									
A large waist line may mean that:- You have too much fat inside your abdomen.	27.2	24.1	38.2	33.7	**0.029**	1.00	0.85 0.52, 1.39	**1.67 1.09, 2.55**	1.41 0.98, 2.02
Energy imbalance.	8.6	20.7	16.2	26.4	**0.001**	1.00	**2.79 1.54, 5.05**	**2.10 1.15, 3.83**	**3.71 2.29, 6.01**
Knowledge about health effects									
Fat coats internal organs increasing risk of serious illness	17.9	22.4	22.6	27.1	0.068	1.00	1.32 0.79, 2.23	1.31 0.80, 2.15	**1.77 1.18, 2.64**
Knowledge about current risk and prevention									
Eat less snack and take away foods	5.2	7.8	6.6	11.2	0.055	1.00	1.52 0.66, 3.51	1.31 0.57, 3.04	**2.29 1.21, 4.30**
Eat more vegetables, fruit and lean meat	6.5	5.2	5.1	9.7	0.230	1.00	0.78 0.31, 1.99	0.76 0.31, 1.85	1.74 0.94, 3.22
Be moderately active for at least 30 mins each day	3.1	6.0	5.1	5.0	0.475	1.00	2.02 0.75, 5.43	1.70 0.63, 4.60	1.70 0.73, 3.99

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign, and 75 who did not provide any socioeconomic information.
[2] Number of respondents answering the question ranged 688-690. This includes both those who did not answer the education question nor the knowledge question.
[3] Adjusted for age and gender.

OCCUPATION

Table 4.32 examines associations between respondents' occupation and knowledge about Overweight. Statistically significant bivariate associations are observed between respondents' occupation and knowledge about large waistline and energy imbalance (p=0.004), and fat coating the abdominal organs (p=0.002). Blue collar workers had the highest proportions of incorrect scores.

Results of multivariable analyses show that respondents with Blue Collar occupations are significantly more likely than Managers/Professionals to give an incorrect response to items regarding large waistline and energy imbalance (OR 2.31; 95% CI 1.28 – 4.14), and fat coating the abdominal organs (OR 2.20; 95% CI 1.35 – 3.60). As well, White Collar workers were significantly more likely than workers in the referent group to give incorrect responses regarding breast cancer (OR 1.69; 95% CI 1.15– 2.51), and energy imbalance (OR 1.86; 95% CI 1.16 – 3.00).

Table 4.32 Relationships between Occupation and incorrect knowledge about Overweight

Knowledge Item	% incorrect[1,2,3] Man/ Prof	White collar	Blue collar	p. value	Odds ratio (95% CI)[4] Man/ Prof	White collar	Blue collar
Knowledge about current risk and prevention							
Excess body weight increases risk of: - Skin cancer.	21.8	22.3	19.4	0.836	1.00	1.14 0.76, 1.73	0.80 0.46, 1.40
Breast cancer (post-menopause).	69.0	74.2	78.6	0.109	1.00	**1.69** **1.15, 2.51**	1.30 0.76, 2.23
Prostate cancer.	76.0	80.3	80.6	0.369	1.00	1.35 0.89, 2.04	1.26 0.73, 2.19
Leukaemia.	51.0	42.8	52.4	0.105	1.00	0.80 0.57, 1.13	0.94 0.60, 1.47
Bowel cancer.	55.7	58.1	66.0	0.177	1.00	1.22 0.87, 1.73	1.40 0.88, 2.23
Knowledge about the condition							
A large waist line may mean that: - You have too much fat inside your abdomen	28.0	31.9	35.3	0.308	1.00	1.23 0.85, 1.77	1.39 0.87, 2.24
Energy imbalance.	10.9	19.2	21.4	**0.004**	1.00	**1.86** **1.16, 3.00**	**2.31** **1.28, 4.14**
Knowledge about health effects							
Fat coats internal organs increasing risk of serious illness.	19.3	19.7	35.0	**0.002**	1.00	1.06 0.69, 1.62	**2.20** **1.35, 3.60**
Knowledge about current risk and prevention							
Eat less snack and take away foods.	5.9	6.6	7.8	**0.765**	1.00	1.52 0.66, 3.51	1.31 0.57, 3.04
Eat more vegetables, fruit and lean meat.	7.0	4.4	6.8	0.407	1.00	0.69 0.32, 1.48	0.92 0.38, 2.22
Be moderately active for at least 30 mins each day.	3.4	3.9	3.9	0.924	1.00	1.27 0.52, 3.11	1.13 0.35, 3.63

[1] Total population N = 845 excludes 139 respondents who were unaware of the Measure Up campaign, and 75 who did not provide any socioeconomic information.
[2] Numbers responding to items ranged from 688-690. This includes both those who did not answer the occupation question nor the knowledge question.
[3] Interpretation of the Not Easily Classified (NEC) category was difficult due to the group heterogeneity and thus excluded from Chi Square analyses. The NEC group includes respondents who were studying, unemployed, permanently unable to work, retired, and engaged in home duties on a full-time basis (see profile Table 3.5).
[4] Adjusted for age and gender.

YEARLY HOUSEHOLD INCOME

Table 4.33 examines relationships between yearly household Income and respondents’ knowledge about Overweight. Statistically significant bivariate associations are observed in items regarding large waistline and energy balance (p=0.001), and prevention by eating less snack foods (p=0.001), eating more vegetables, fruit and lean meat (p=0.006), and minimum physical activity of less than 30 minutes (p=0.001).

Multivariable results show that compared to high income respondents, those with low incomes have significantly higher odds of an incorrect response regarding excess body weight and risk of bowel cancer (OR 2.05; 95% CI 1.13 – 3.71), large waistline and energy imbalance (OR 2.73; 95% CI 1.46-5.09), prevention by eating less snack and take-away foods (OR 10.69; 95% CI 3.90-29.33), eating more vegetables, fruit and lean meat (OR 4.24; 95% CI 1.80-10.01), and minimum physical activity of less than 30 minutes (OR 14.22; 95% CI 3.71-54.41).

Table 4.33 Relationships between Income[1] and incorrect knowledge about Overweight

	% Incorrect[2, 3]					Odds ratio (95% CI)[4]			
Knowledge Item	High	Mid	Low-Mid	Low	p. value	High	Middle	Low-Middle	Low
Knowledge about current risk and prevention									
Excess body weight increases risk of:- Skin cancer.	23.5	17.3	20.9	26.4	0.261	1.00	0.71 0.45, 1.12	0.95 0.59, 1.52	1.29 0.70, 2.3
Breast cancer (post menopause).	72.4	70.6	70.1	81.7	0.270	1.00	0.50 0.25, 1.00	0.50 0.25, 1.00	0.53 0.26, 1.06
Prostate cancer.	77.8	75.3	79.7	84.5	0.386	1.00	0.87 0.57, 1.34	1.10 0.68, 1.77	1.55 0.76, 3.17
Leukaemia.	49.0	44.2	46.8	49.3	0.733	1.00	0.91 0.53, 1.57	0.79 0.46, 1.36	0.93 0.53, 1.57
Bowel cancer.	58.7	55.0	59.4	73.2	0.057	1.00	0.89 0.62, 1.29	1.10 0.74, 1.65	**2.05** **1.13, 3.71**
Knowledge about the condition									
A large waist line may mean that:- You have too much fat inside your abdomen.	28.1	29.1	28.3	36.1	0.600	1.00	1.07 0.71, 1.59	1.04 0.67, 1.60	1.46 0.83, 2.57
Over time, you have taken in more energy than you have burnt = energy imbalance.	14.0	11.7	18.3	31.9	**0.001**	1.00	0.79 0.46, 1.37	1.26 0.74, 2.15	**2.73** **1.46, 5.09**
Knowledge about health effects									
Fat coats internal organs increasing risk of serious illness.	17.4	20.8	24.1	25.0	0.295	1.00	1.29 0.81, 2.05	1.60 0.98, 2.60	1.66 0.88, 3.15
Knowledge about current risk and prevention									
Eat less snack & take away foods.	2.5	7.8	7.0	21.1	**0.001**	1.00	**3.42** **1.33, 8.80**	**3.13** **1.15, 8.57**	**10.69** **3.90, 29.33**
Eat more vegetables, fruit & lean meat.	5.3	6.9	5.3	16.9	**0.006**	1.00	1.41 0.66, 3.01	1.20 0.50, 2.84	**4.24** **1.80, 10.01**
You should be moderately active for at least 30 mins a day.	1.2	4.3	3.2	13.9	**0.001**	1.00	**3.86** **1.05, 14.26**	3.01 0.73, 12.45	**14.22** **3.71, 54.41**

[1] Yearly household Income – High = AU> $130,000, Middle = AU$72,800 - $129,999, Low-middle =AU $31,200 - $72,799, Low = < AU$31,199.
[2] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign, and 75 who did not provide any socioeconomic information.
[3] N = Number of respondents answering the question ranges 731-733. This includes both those who did not answer the income question nor the knowledge questions.
[4] Adjusted for age and gender.

4.2.10 RELATIONSHIPS BETWEEN SOCIOECONOMIC INDICATORS AND UNDERSTANDING OF THE TERMS RELATED 'TO OVERWEIGHT'

EDUCATION

Table 4.34 presents associations between education and mean understanding index scores (Model 1) that indicate an overall understanding of the term 'Overweight'. Compared to the referent group, respondents with no post-school education (p=0.001), and Certificate/ Trade levels of education (p=0.020) had significantly lower scores and thus a lower overall understanding of the term in Model 1. Respondents with no post-school education maintained a statistically significant difference from the higher educated referent group after adjustment for occupation in Model 2 (p<0.001), income in Model 3 (p<0.001), and also for all socioeconomic measures simultaneously in Model 4 (p=0.001). Therefore, having no post-school education remained an important predictor (p<0.001) of the lowest overall understanding of the term 'Overweight' across all models.

OCCUPATION

Table 4.35 presents associations between occupation and respondents' overall understanding of the term 'Overweight'. In Model 1 Blue Collar workers (p=0.010) have significantly lower Understanding Index scores than did the referent group of Managers/ Professionals. After adjustment for Income in Model 2, Blue Collar workers' scores are again significantly lower (p=0.045) than those of the referent group. When adjusted for Education in Model 3 and simultaneously for all socioeconomic measures in Model 4, Blue Collar workers' scores are lower than those of the referent but the difference does not reach statistical significance.

INCOME

Table 4.36 examines relationships between income and overall understanding of the term 'Overweight'. Model 1 shows mean index scores of respondents with low income levels to be significantly lower (p=0.001), than those of the high income referent group. When Model 1 is adjusted separately for the effects of education in Model 2 (p=0.022), Occupation in Model 3 (p=0.004) and simultaneously for all socioeconomic measures in Model 4 (p=0.022), the mean index score remains significantly lower for respondents living in low-income households.

Table 4.34 Relationships between Education and the Understanding Index[1] for terminology regarding Overweight

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Education ***(n = 841)***																
Bach./ higher	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
Dip/ Ass. Deg.	-0.432	0.23	-0.878, 0.015	0.058	-0.401	0.24	-0.862, 0.060	0.088	-0.390	0.23	-0.849, 0.069	0.096	-0.360	0.25	-0.840, 0.120	0.141
Cert/ Trade	-0.501	0.22	-0.923, -0.080	**0.020**	-0.390	0.24	-0.856, 0.076	0.101	-0.414	0.23	-0.861, 0.033	0.070	-0.348	0.25	-0.842, 0.146	0.167
No post-school	-0.928	0.18	-1.276, -0.580	**0.001**	-0.793	0.20	-1.186, -0.400	**0.001**	-0.789	0.19	-1.168, -0.409	**0.001**	-0.741	0.22	-1.163, -0.320	**0.001**
Occupation ***(n = 833)***																
Man. / Prof.					1.00	-	-	-					1.00	-	-	-
White collar					0.020	0.20	-0.367, 0.406	0.921					-0.036	0.21	-0.444, 0.372	0.863
Blue collar					-0.249	0.26	-0.765, 0.267	0.344					-0.201	0.27	-0.736, 0.334	0.462
Income ***(n = 727)***																
High									1.00	-	-	-	1.00	-	-	-
Middle									0.094	0.19	-0.281, 0.469	0.623	0.126	0.19	-0.252, 0.503	0.513
Low-Middle									-0.099	0.21	-0.514, 0.315	0.637	-0.022	0.22	-0.447, 0.403	0.918
Low									-0.890	0.29	-1.451, -0.328	**0.002**	-0.706	0.31	-1.310, -0.102	**0.022**

[1] Index of 11 knowledge items. Possible score 0-11 (11 indicates high knowledge score).
[2] Model 1 = Education/ Age/ Gender
[3] Model 2 = Education / / Occupation /Age/ Gender
[4] Model 3 = Education / Income/ Age / Gender
[5] Model 4 = Education Occupation/ Income/ Age/ Gender
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the modelling they are a mixed group, difficult to interpret with confidence or reliability and thus not presented here.

Table 4.35 Relationships between Occupation and the Understanding index[1] for terminology regarding Overweight

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value	B	(Se)	CI (95%)	p. value
Occupation	***(n =833)***															
Man./ Prof.	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
White collar	-0.278	0.18	-0.634, 0.078	0.125	-0.300	0.19	-0.676, 0.076	0.117	0.020	0.20	-0.367, 0.406	0.921	-0.036	0.21	-0.444, 0.372	0.863
Blue collar	-0.605	0.24	-1.067, -0.143	**0.010**	-0.493	0.25	-0.974, -0.012	**0.045**	-0.249	0.26	-0.765, 0.267	0.344	-0.201	0.27	-0.736, 0.334	0.462
Income	***(n = 727)***															
High					1.00	-	-	-					1.00	-	-	-
Middle					0.042	0.19	-0.334, 0.417	0.828					0.126	0.19	-0.252, 0.503	0.513
Low-middle					-0.137	0.21	-0.558, 0.283	0.521					-0.022	0.22	-0.447, 0.403	0.918
Low					-0.871	0.31	-1.470, -0.272	**0.004**					-0.706	0.31	-1.310, -0.102	**0.022**
Education	***(n = 841)***															
Bach./ higher									1.00	-	-	-	1.00	-	-	-
Dip. /Ass. Deg.									-0.401	0.24	-0.862, 0.060	0.088	-0.360	0.25	-0.840, 0.120	0.141
Cert. / Trade									-0.390	0.24	-0.856, 0.076	0.101	-0.348	0.25	-0.842, 0.146	0.167
No post-school									-0.793	0.20	-1.186, -0.400	**0.001**	-0.741	0.22	-1.163, -0.320	**0.001**

[1] Index of 11 knowledge items. Possible score 0-11 (11 indicates high knowledge score).
[2] Model 1 = Occupation/ Age/ Gender.
[3] Model 2 = Occupation / Income/Age/ Gender
[4] Model 3 = Occupation / Education / Age / Gender.
[5] Model 4 = Occupation/ Income/ Education/ Age/ Gender.
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the modelling they are a mixed group, difficult to interpret with confidence or reliability and thus not presented here.

Table 4.36 Relationships between Income and the Understanding index[1] for terminology regarding Overweight

	Model 1[2]				Model 2[3]				Model 3[4]				Model 4[5]			
	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value	β	(Se)	CI (95%)	p. value
Income	***(n =727)***															
High	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
Middle	-0.053	0.19	-0.423, 0.317	0.779	0.094	0.19	-0.281, 0.469	0.623	0.042	0.19	-0.334, 0.417	0.828	0.126	0.19	-0.252, 0.503	0.513
Low-mid	-0.335	0.20	-0.735, 0.064	0.100	-0.099	0.21	-0.514, 0.315	0.637	-0.137	0.21	-0.558, 0.283	0.521	-0.022	0.22	-0.447, 0.403	0.918
Low	-1.190	0.28	-1.736, -0.644	**0.001**	-0.890	0.29	-1.451, -0.328	**0.002**	-0.871	0.31	-1.470, -0.272	**0.004**	-0.706	0.31	-1.310, -0.102	**0.022**
Education	***(n = 841)***															
Bach					1.00	-	-	-					1.00	-	-	-
Dip/ Ass. degree					-0.390	0.23	-0.849, 0.069	0.096					-0.360	0.25	-0.840, 0.120	0.141
Cert/ Trad					-0.414	0.23	-0.861, 0.033	0.070					-0.348	0.25	-0.842, 0.146	0.167
No post-school					-0.789	0.19	-1.168, -0.409	**0.001**					-0.741	0.22	-1.163, -0.320	**0.001**
Occupation	***(n = 833)***															
Man/ Profs									1.00	-	-	-	1.00	-	-	-
White collar									-0.300	0.19	-0.676, 0.076	0.117	-0.036	0.21	-0.444, 0.372	0.863
Blue collar									-0.493	0.25	-0.974, -0.012	**0.045**	-0.201	0.27	-0.736, 0.334	0.462

[1] Index of 11 knowledge items. Possible score 0-11 (11 indicates high knowledge score).
[2] Model 1 = Income/ Age/ Gender.
[3] Model 2 = Income / Education /Age/ Gender.
[4] Model 3 = Income/Occupation/Age/Gender.
[5] Model 4 = Income/ Education/ Occupation/ Age/ Gender
[6] Whilst results for the Not Easily Classified (NEC) group were retained in the modelling they are a mixed group, difficult to interpret with confidence or reliability and thus not presented here.

4.2.11 SUMMARY OF THE RELATIONSHIPS BETWEEN SEP AND KNOWLEDGE ABOUT WAIST MEASUREMENT

Table 4.37 presents a summary of results regarding the main focus of the *Measure Up* campaign. This focus is about awareness and knowledge regarding excess weight around the waistline and overweight, and how this knowledge differs by SEP. The results of the 8 items addressing risk (items 1 & 2), knowledge about the meaning of overweight and large waistline (items 3,4,& 5), and actions that should be taken for a large waistline (items 6, 7, & 8) have been transcribed from other results tables in this chapter as indicated in the 'Table' column.

Bivariate relationships between socioeconomic indicators and the proportions of incorrect responses to each item are presented along with age and gender adjusted odds of having incorrect answers. Overwhelmingly, the majority of instances of highest proportions of incorrect answers are found for respondents with No Post-schooling, Blue Collar occupations, and Low household income. Similarly, significantly higher odds of incorrect answers are found for respondents who are of low SEP.

ITEMS ABOUT 'INCREASED RISK'

For item 1 regarding knowledge about increased risk of chronic disease with larger than recommended waistline measurement, the highest proportions of incorrect answers were for respondents with no post schooling (p=0.004), blue collar occupations (p=0.001), and those with low household income (p=0.001). In item 2 regarding knowledge that excess weight around the waist is associated with diabetes, the highest proportions of incorrect answers were for respondents who had No Post-school qualifications (p=0.001), and those with Low household income (p=0.001). Age and gender adjusted multivariable analyses show that for item 1 the odds of giving incorrect answers are far greater for respondents with No Post-school and Certificate / Trade levels of education, and Blue collar workers. For item 2, the odds of respondents giving an incorrect answer are significantly higher for those with No Post-school qualifications, and Low household income.

ITEMS REGARDING KNOWLEDGE ABOUT THE MEANING OF 'OVERWEIGHT' AND 'LARGE WAISTLINE'

For item 3 regarding too much fat in the abdomen, the highest proportion of incorrect answers was found for respondents with Certificate / Trade levels of education (p=0.029), and this group also had the highest significant age and gender adjusted odds of having an incorrect answer. For item 4 regarding knowledge about the relationship between large waistline energy balance, the highest proportions of incorrect answers were found for respondents with No Post-school qualifications (p=0.001), Blue collar occupations (p=0.004), and those with the lowest Income (p=0.001). Similarly, multivariable odds of having incorrect answers were highest in these respondent groups. For item 5 regarding knowledge about large waistline and fat coating internal organs, the highest proportion of incorrect answers was found for Blue collar workers (p=0.002), and age and gender adjusted significant odds of having an incorrect answer were found in respondents with No Post schooling and Blue collar occupations.

ITEMS REGARDING ACTIONS THAT SHOULD BE TAKEN IF ONE HAS A LARGE WAISTLINE

For item 6 regarding knowledge about eating less snack and takeaway food, the highest proportion of incorrect answers was found among respondents with Low Incomes (p=0.001). As well, the highest odds of having an incorrect answer were for respondents in this group although the confidence interval was wide (OR 10.69; CI 3.90-29.33). Respondents with No Post-school qualifications also had significantly higher odds of having an incorrect answer. For item 7 regarding eating more fruit and vegetables and lean meat, the highest proportion of incorrect answers was found in respondents who had Low Incomes. Similarly, this group had the highest significant age and gender adjusted odds of having an incorrect answer. Finally, for item 8 regarding being moderately active for at least 30 minutes each day, the highest proportion of incorrect answers was found for those with Low Incomes, again with highest significant odds of having an incorrect answer but also with a wide confidence interval (OR 14.22; CI 3.71-54.41).

Table 4.37 Relationships between SEP and incorrect knowledge regarding overweight and large waistline measurement

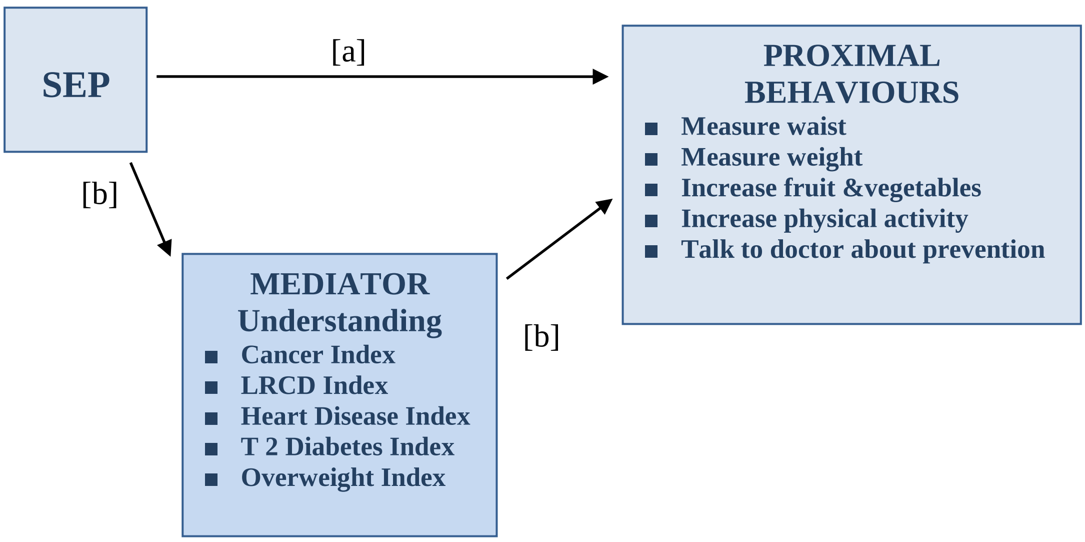
Item	Analysis	Table	Bivariate		Multivariable	
	SEP /Chronic Disease Risk Factor		Highest % incorrect scores	p. value	SEP[1] indicator	OR[1,2] (95%) CI Referent = 1.00
1) Increased risk of LRCD with large waistline measurement > 94 cm (male), > 80cm (fem).	Edu.[3] / LRCD[4]	4.13	No post-sch.	**0.004**	No post-sch.	**2.69; 1.51, 4.77**
					Cert/ Trade	**2.47; 1.28, 4.78**
	Occ.[5] / LRCD	4.14	Blue collar	**0.001**	Blue collar	**3.07; 1.59, 5.9**
	Inc.[6] / LRCD	4.15	Low income	**0.001**	Mid. income	**0.26; 0.12, 0.56**
					Low-mid income	**0.23; 0.11, 0.51**
2) Excess waist weight means higher risk for diabetes	Edu. / T2 Diab[7].	4.19	No post-sch.	**0.001**	No post-sch.	**2.46; 1.53, 3.94**
	Occ. / T2 Diab.	4.20	Blue collar	0.356	Blue collar	1.49; 0.78, 2.82
	Inc. / T2 Diab.	4.21	Low income	**0.001**	Low income	**3.60; 1.85, 7.02**
3) A large waist line may mean you have too much fat inside your abdomen	Edu. / Overweight	4.31	Cert / Trade	**0.029**	Cert / Trade	**1.67; 1.09, 2.55**
	Occ. / Overweight	4.32	Blue collar	0.308	Blue collar	1.39; 0.87, 2.24
	Inc. /. Overweight	4.33	Low income	0.600	Low income	1.46; 0.83, 2.57
4) A large waist line may mean an energy imbalance	Edu. / Overweight	4.31	No post-sch.	**0.001**	No post-sch.	**3.71; 2.29, 6.01**
	Occ./ Overweight	4.32	Blue collar	**0.004**	Blue collar	**2.31; 1.28, 4.14**
	Inc. / Overweight	4.33	Low income	**0.001**	Low income	**2.73; 1.46, 5.09**
5) A large waist line may mean that fat coats the internal organs	Edu. / Overweight	4.31	No post-sch.	0.068	No post-sch.	**1.77; 1.18, 2.64**
	Occ. / Overweight	4.32	Blue collar	**0.002**	Blue collar	**2.20; 1.35, 3.60**
	Inc. / Overweight	4.33	Low income	0.295	Low income	1.66; 0.88, 3.15
6) A large waist line may mean that you should eat less snack & take away foods	Edu. / Overweight	4.31	No post-sch.	0.055	No post-sch.	**2.29; 1.21, 4.30**
	Occ. / Overweight	4.32	Blue collar	0.765	White collar	1.52; 0.66, 3.51
	Inc. / Overweight	4.33	Low income	**0.001**	Low income	**10.69; 3.90, 29.33**
					Mid. income	**3.42; 1.33, 8.80**
7) A large waist line may mean you should eat more fruit vegetables, and lean meat	Edu. / Overweight	4.31	No post-sch.	0.230	No post-sch.	1.74; 0.94, 3.22
	Occ./ Overweight	4.32	Man/ Profs	0.407	Blue collar	0.92; 0.38, 2.22
	Inc. / Overweight	4.33	Low income	**0.006**	Low income	**4.24; 1.80, 10.01**
8) A large waist line may mean you should be moderately active for at least 30 mins each day	Edu. / Overweight	4.31	Diploma / Ass. Degree	0.475	Diploma / Ass. Degree	2.02; 0.75, 5.43
	Occ. / Overweight	4.32	White & Blue collar	0.924	White collar	1.27; 0.52, 3.11
	Inc. / Overweight	4.33	Low income	**0.001**	Low income	**14.22; 3.71, 54.41**

1 Blue shading indicates significant results in low SEP groups. Pink shading less likely to be incorrect.
2 All Odds Ratios are age and gender adjusted.
3 Edu. = Education
4 LRCD = Lifestyle Related Chronic Disease
5 Occ. = Occupation
6 Inc. = Income
7 T2 Diab. = Type 2 Diabetes

4.3 RESULTS ADDRESSING RESEARCH QUESTION 3: *What is the relationship between socioeconomic position and effectiveness of mass media health promotion campaign messages in terms of proximal behaviour response?*

This section relates to the "Effectiveness" phase of the RUE study model. The hypothesised paths are depicted in Figure 4.1. Path [a] depicts a direct influence of socioeconomic position on respondents being prompted to both engage in proximal behaviours and go online to the campaign website. Path [b] hypothesises that socioeconomic differences in respondents' being prompted by the campaign to engage in proximal behaviours, are mediated by their understanding of chronic disease and risk factor terminology. Also presented later in this section are results of respondents' pursuit of online information from the *Measure Up* campaign website.

Figure 4.1 Model depicting hypothesised paths of effect of socioeconomic position on being prompted by the *Measure Up* campaign to engage in proximal behaviours



4.3.1 RELATIONSHIPS BETWEEN SEP AND BEING PROMPTED BY THE *MEASURE UP* CAMPAIGN TO ENGAGE IN PROXIMAL BEHAVIOURS: Path [a]

EDUCATION

Table 4.38 presents bivariate associations between respondents' education levels and being prompted by the *Measure Up* campaign to engage in proximal behaviours. No significant bivariate relationships were found. There were, however, in age and gender adjusted multivariable modelling, significant relationships between those with a Diploma or Associate degree and being prompted to increase both physical activity (OR 1.66; 95% CI 1.08-2.55), and fruit and vegetable intake (OR 1.83; 95% CI 1.19-2.83). Although not statistically significant, the odds for prompting of all behaviours were higher at all education levels than the referent group.

Table 4.38 Relationships between Education and proximal behaviours

Item	Prompted to engage in behaviour: % reporting 'yes'					Odds ratio[3] (95% CI) of reporting yes			
	Bach/ high	Dip/Ass. degree	Cert/ Trade	No post-school	p. value	Bach/ high	Dip/ Ass. degree	Cert/ Trade	No post-school
The *Measure Up* campaign ads have prompted me to:-									
Measure my waistline	36.7	40.0	32.4	40.6	0.393	1.00	1.17 0.75, 1.82	0.85 0.55, 1.30	1.12 0.79, 1.58
Measure my Weight	46.9	54.8	54.1	54.3	0.223	1.00	1.38 0.90, 2.11	1.29 0.86, 1.93	1.34 0.96, 1.88
Increase my physical activity	45.9	58.3	45.9	51.9	0.091	1.00	**1.66** **1.08, 2.55**	1.01 0.67, 1.51	1.20 0.86, 1.68
Increase fruit & vegetable consumption	39.3	53.9	45.2	45.0	0.055	1.00	**1.83** **1.19, 2.83**	1.26 0.84, 1.91	1.14 0.81 1.60
Talk to my doctor about preventing chronic disease	16.6	19.1	18.5	20.6	0.661	1.00	1.20 0.69, 2.08	1.09 0.64, 1.86	1.25 0.82, 1.92

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign and 75 respondents who did not provide any socioeconomic information.
[2] Number of respondents who answered the item ranged 826-828. This includes both those who did not answer the occupation item nor the knowledge item.
[3] Adjusted for age and gender.

OCCUPATION

Table 4.39 examines associations between respondents' Occupation and being prompted by the *Measure Up* campaign to engage in proximal behaviours. For most behaviours the highest proportions being prompted to engage were seen in those respondents with White collar occupations but did not reach statistical significance level.

Age and gender adjusted multivariable analysis indicated that the odds of waist measurement, increasing fruit and vegetable intake and talking to the doctor about preventing chronic disease were lowest in Blue Collar workers; however, there were no statistically significant differences between these workers and the Managers / Professionals reference group.

Table 4.39 Relationships between Occupation and prompting of proximal behaviours

Item	Prompted to engage in behaviour: % reporting yes [1,2,3]				Odds ratio (95% CI)[4]		
	Man/ Profs	White collar	Blue collar	p. value	Man/ Profs	White collar	Blue collar
The Measure Up campaign ads have prompted me too:							
Measure my waistline	36.6	37.6	32.7	0.903	1.00	1.00 0.70, 1.43	0.90 0.56, 1.45
Weigh myself	50.7	48.2	57.7	0.535	1.00	0.94 0.66, 1.32	1.25 0.80, 1.97
Increase my physical activity	46.5	54.0	50.0	0.495	1.00	1.21 0.86, 1.71	1.18 0.75, 1.84
Increase my fruit and vegetable consumption	43.4	44.5	41.3	0.908	1.00	0.95 0.67, 1.34	0.93 0.59, 1.47
Talk to my doctor about preventing chronic disease	17.3	17.7	15.5	0.967	1.00	1.11 0.71, 1.75	0.85 0.46, 1.56

1 Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign, and 75 who did not provide any socioeconomic information.
2 Numbers responding to items ranged from 681-687. This includes both those who did not answer the occupation item nor the knowledge item.
3 Interpretation of the Not Easily Classified (NEC) category was difficult due to group heterogeneity and thus excluded from Chi Square analyses. The NEC group includes respondents who were studying, unemployed, permanently unable to work, retired, and engaged in home duties on a full-time basis (see profile Table 3.5).
4 Adjusted for age and gender.

YEARLY HOUSEHOLD INCOME

Table 4.40 examines relationships between respondents' levels of income and the likelihood of being prompted to engage in proximal behaviours. Significant bivariate relationships were found between Income and being prompted to measure the waistline (p=0.013), and being prompted to talk to the doctor about preventing chronic disease (p=0.016).

Low-middle income households were significantly more likely than those in the High Income referent group to be prompted to increase their fruit and vegetable consumption (OR 1.53; 95% CI 1.03-2.28), and talk to their doctor about preventing chronic disease (OR 2.28; 95% CI 1.35-3.85). Middle income earners also were significantly more likely than high income earners to measure their waistline (OR 1.75; 95% CI 1.19-2.56), and their weight (OR 1.43; 95% CI 1.00-2.07).

Table 4.40 Relationship between Income[1] and proximal behaviours

	% prompted to engage in behaviour[2,3]					Odds ratio (95% CI)[4]			
Item	High	Middle	Low-middle	Low	p. value	High	Middle	Low-middle	Low
The *Measure Up* campaign ads have prompted me to:-									
Measure my waistline	30.7	44.3	40.9	32.9	**0.013**	1.00	**1.75** **1.19, 2.56**	1.37 0.91, 2.07	1.01 0.57, 1.81
Weigh myself	47.5	55.9	55.4	45.7	0.151	1.00	**1.43** **1.00, 2.07**	1.39 0.94, 2.07	0.94 0.55, 1.62
Increase my physical activity	44.8	50.2	55.1	50.0	0.211	1.00	1.22 0.85, 1.75	1.41 0.95, 2.09	1.15 0.67, 1.98
Increase my fruit and vegetable consumption	36.9	45.2	50.0	44.3	0.053	1.00	1.38 0.95, 1.20	**1.53** **1.03, 2.28**	1.22 0.71, 2.12
Talk to my doctor about preventing chronic disease	12.4	16.5	24.2	17.4	**0.016**	1.00	1.43 0.85, 2.41	**2.28** **1.35, 3.85**	1.49 0.71, 3.13

1 Yearly household Income – High = AU> $130,000, Middle = AU$72,800 - $129,999, Low-middle = AU$31,200 - $72,799, Low = < AU$31,199.
2 Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign and 75 respondents who did not provide any SE information.
3 Number of respondents who answered the item ranged from 725-727; this includes those not providing response to the income item and those not providing a response to the prompted behaviour item.
4 Adjusted for age and gender.

4.3.2 RELATIONSHIPS BETWEEN SEP AND RESPONDENTS' UNDERSTANDING OF CHRONIC DISEASE RISK FACTOR TERMINOLOGY AND THEIR BEING PROMPTED TO ENGAGE IN PROXIMAL BEHAVIOURS: PATH [b]

Path [b] hypothesises that socioeconomic differences in respondents' being prompted by the campaign to engage in proximal behaviours, are mediated by their understanding of chronic disease and risk factor terminology. Table 4.41 examines relationships between respondents' Understanding Index score and the likelihood of their being prompted by the *Measure Up* campaign to engage in proximal behaviours. Index scores are categorised into High, Medium and Low tertiles.

Results of multivariable analyses indicate that compared to respondents with Understanding Index scores in the highest tertile, those with scores in the lowest tertile for understanding Cancer (OR 0.62; 95% CI 0.40-0.96), LRCD (OR 0.63; 95% CI 0.45-0.88) Type 2 Diabetes (OR 0.62; 95% CI 0.47-0.97), and Overweight (OR 0.54; 95% CI 0.37-0.79) were significantly less likely to be prompted to measure their waist. Those with scores in the lowest tertile for understanding Overweight were also significantly less likely to measure their weight (OR 0.66; 95% CI 0.46-0.95). Those with scores in the lowest tertile for understanding Type 2 Diabetes were significantly less likely to increase their fruit and vegetable consumption (OR 0.68; 95% CI 0.48-0.96).

Those in the Medium tertile for understanding heart disease were more likely to increase their physical activity (OR 1.45; 95% CI 1.01, 2.07), and to talk to their doctor (OR 2.51; 95% CI 1.59, 3.95), about preventing chronic disease than those in the High tertile.

Table 4.41 Relationships between respondents' Understanding Indexes and proximal behaviours

Index	UI[1] Score	Waist OR (95%) CI	Weight OR (95%) CI	Physical Activity OR (95%) CI	Fruit & Vegetable OR (95%) CI	Talked to Doctor OR (95%) CI
Cancer	High	1.00	1.00	1.00	1.00	1.00
	Med.	0.85; 0.63, 1.16	0.89; 0.66, 1.21	1.01; 0.75, 1.37	1.12; 0.83, 1.52	1.22; 0.83, 1.80
	Low	**0.62; 0.40, 0.96**	0.91; 0.61, 1.36	0.88; 0.59, 1.31	0.84; 0.56, 1.26	1.19; 0.71, 1.98
Lifestyle Related Chronic Disease	High	1.00	1.00	1.00	1.00	1.00
	Med.	0.87; 0.60, 1.26	0.88; 0.61, 1.27	1.02; 0.71, 1.46	1.09; 0.75, 1.57	1.03; 0.64, 1.70
	Low	**0.63; 0.45, 0.88**	0.79; 0.58, 1.08	0.80; 0.58, 1.09	0.84; 0.61, 1.15	1.09; 0.73, 1.61
Type 2 Diabetes	High	1.00	1.00	1.00	1.00	1.00
	Med.	0.97; 0.69, 1.37	1.04; 0.75, 1.45	1.04; 0.75, 1.46	0.87; 0.62, 1.22	0.78; 0.51, 1.18
	Low	**0.68; 0.47, 0.97**	0.87; 0.62, 1.24	0.81; 0.57, 1.15	**0.68; 0.48, 0.96**	0.66; 0.42, 1.03
Heart Disease	High	1.00	1.00	1.00	1.00	1.00
	Med.	1.02; 0.71, 1.48	1.28; 0.89, 1.83	**1.45; 1.01, 2.07**	1.22; 0.85, 1.75	**2.51; 1.59, 3.95**
	Low	0.82; 0.59, 1.13	1.00; 0.73, 1.37	0.89; 0.65, 1.22	1.01; 0.73, 1.39	1.44; 0.93, 2.23
Over-weight	High	1.00	1.00	1.00	1.00	1.00
	Med.	0.73; 0.52, 1.04	0.89; 0.63, 1.25	1.11; 0.78, 1.56	0.95; 0.67, 1.34	0.89; 0.57, 1.40
	Low	**0.54; 0.37, 0.79**	**0.66; 0.46, 0.95**	0.86; 0.60, 1.24	0.87; 0.61, 1.26	1.06; 0.67, 1.68

[1] UI = Understanding Index score for each Chronic Disease Risk Factor (CDRF) category.

4.3.3 THE CONTRIBUTION OF UNDERSTANDING TO THE ASSOCIATION BETWEEN SEP AND PROXIMAL BEHAVIOUR

EDUCATION

To examine the mediation effects (Figure 4.1) of understanding on the above relationships, separate examination of each CDRF index was performed in logistic regression analyses. Baseline Model 1 included respondents' education levels adjusted for age and gender. Models 2-6 included the components of Model 1 plus an additional adjustment for each CDRF Understanding Index score, grouped into tertiles of High, Medium, and Low.

Table 4.42 examines the effect that respondents' understanding about each Chronic Disease/ Risk Factor (CDRF) has on the relationship between their level of education and being prompted by the *Measure Up* campaign to engage in proximal behaviour change. Separate examination of each CDRF was performed in logistic regression analyses with the baseline Model 1 depicting respondents' Education level adjusted for age and gender. Models 2-6 included the components of Model 1 plus an additional adjustment for each CDRF Understanding Index score grouped into tertiles of High, Medium, and Low.

The contribution of understanding was significant in the relationship between respondents' Education level and the behaviour Weight Measurement in two models adjusted for CDRF understanding. In Model 3, for those who had No Post-school education, a greater understanding of LRCD (OR 1.41; 95% CI 1.00, 1.98) increased the likelihood, compared to Model 1, of these respondents measuring their weight. In Model 6, a greater understanding of Overweight (OR 1.43; 95% CI 1.02, 2.00) also significantly increased the likelihood, compared to Model 1, of these respondents measuring their weight.

For respondents with Diploma or Associate Degree levels of education, compared to Model 1 (education level adjusted for age and gender), a greater understanding in all CDRF areas (except for Heart Disease), significantly increased the likelihood of these respondents both increasing their physical activity and increasing their fruit and vegetable consumption. The differences in odds between the individual understanding models and Baseline Model 1 were minimal suggesting that understanding had very little mediation effect on these behaviours.

When considering the overall mediation effect, because there is very little difference in odds between the models adjusted for understanding about each Chronic Disease/ Risk Factor (CDRF) and Education level adjusted only for Age and Gender, there was no compelling evidence that understanding influences the association between education level and being prompted by the campaign to engage in proximal behaviour.

Table 4.42 The contribution of Understanding to Education differences in Proximal Behaviour

Adjustment Model (Age/ Gender/ Index)	Bach/ Higher Degree OR (referent)	Dip. Ass. Degree OR (95%) CI	Cert. /Trade OR (95%) CI	No Post-school OR (95%) CI
Measure waist				
Model 1[1] Age/ Gender	1.00	1.17; 0.75, 1.82	0.85; 0.55, 1.30	1.12; 0.79, 1.58
Model 2[2] Cancer	1.00	1.22; 0.78, 1.89	0.87; 0.56, 1.34	1.19; 0.84, 1.69
Model 3[3] LRCD[7]	1.00	1.21; 0.77, 1.88	0.88; 0.57, 1.35	1.21; 0.85, 1.72
Model 4[4] Type 2 Diabetes	1.00	1.21; 0.78, 1.88	0.86; 0.56, 1.33	1.17; 0.82, 1.65
Model 5[5] Heart Disease	1.00	1.18; 0.76, 1.84	0.88; 0.57, 1.36	1.17; 0.82, 1.67
Model 6[6] Overweight	1.00	1.22; 0.78, 1.91	0.88; 0.57, 1.37	1.21; 0.85, 1.72
Measure weight				
Model 1 Age/ Gender	1.00	1.38; 0.90, 2.11	1.29; 0.86, 1.93	1.34; 0.96, 1.88
Model 2[2] Cancer	1.00	1.40; 0.91, 2.15	1.30; 0.86, 1.95	1.38; 0.98, 1.94
Model 3[3] LRCD	1.00	1.40; 0.91, 2.16	1.31; 0.87, 1.98	**1.41; 1.00, 1.98**
Model 4[4] Type 2 Diabetes	1.00	1.40; 0.91, 2.15	1.30; 0.86, 1.95	1.37; 0.98, 1.93
Model 5[5] Heart Disease	1.00	1.34; 0.87, 2.07	1.33; 0.88, 2.00	1.36; 0.97, 1.92
Model 6[6] Overweight	1.00	1.41; 0.92, 2.18	1.32; 0.87, 1.98	**1.43; 1.02, 2.00**
Increase my physical activity				
Model 1 Age/ Gender	1.00	**1.66; 1.08, 2.55**	1.01; 0.67, 1.51	1.20; 0.86, 1.68
Model 2[2] Cancer	1.00	**1.68; 1.09, 2.58**	1.02; 0.68, 1.53	1.23; 0.88, 1.73
Model 3[3] LRCD	1.00	**1.68; 1.09, 2.59**	1.02; 0.68, 1.54	1.25; 0.89, 1.76
Model 4[4] Type 2 Diabetes	1.00	**1.69; 1.10, 2.61**	1.02; 0.68, 1.53	1.24; 0.88, 1.73
Model 5[5] Heart Disease	1.00	**1.60; 1.04, 2.48**	1.07; 0.71, 1.61	1.24; 0.88, 1.75
Model 6[6] Overweight	1.00	**1.67; 1.08, 2.57**	1.00; 0.66, 1.51	1.22; 0.87, 1.72

Adjustment Model (Age/ Gender/ Index)	Bach/ Higher degree OR (referent)	Dip. Ass. Degree OR (95%) CI	Cert. Trade OR (95%) CI	No Post-school OR (95%) CI *(continued)*
Increase my fruit and vegetable consumption				
Model 1 Age/ Gender	1.00	**1.83; 1.19, 2.83**	1.26; 0.84, 1.91	1.14; 0.81, 1.60
Model 2[2] Cancer	1.00	**1.85; 1.20, 2.86**	1.29; 0.85, 1.94	1.17; 0.83, 1.65
Model 3[3] LRCD	1.00	**1.85; 1.2, 2.85**	1.27; 0.84, 1.93	1.18; 0.83, 1.66
Model 4[4] Type 2 Diabetes	1.00	**1.89; 1.22, 2.92**	1.30; 0.86, 1.96	1.20; 0.85, 1.69
Model 5[5] Heart Disease	1.00	**1.80; 1.16, 2.78**	1.29; 0.85, 1.95	1.14; 0.81, 1.62
Model 6[6] Overweight	1.00	**1.85; 1.20, 2.86**	1.28; 0.85, 1.94	1.16; 0.83, 1.64
Talk to my doctor about prevention of chronic disease.				
Model 1[1] Age/ Gender	1.00	1.20; 0.69, 2.08	1.09; 0.64, 1.86	1.25; 0.82, 1.92
Model 2[2] Cancer	1.00	1.18; 0.68, 2.05	1.09; 0.64, 1.85	1.23; 0.79, 1.89
Model 3[3] LRCD	1.00	1.20; 0.69, 2.08	1.09; 0.64, 1.85	1.24; 0.81, 1.92
Model 4[4] Type 2 Diabetes	1.00	1.23; 0.70, 2.13	1.13; 0.66, 1.92	1.31; 0.85, 2.03
Model 5[5] Heart Disease	1.00	1.06; 0.61, 1.86	1.14; 0.67, 1.96	1.18; 0.76, 1.83
Model 6[6] Overweight	1.00	1.20; 0.69, 2.09	1.11; 0.65, 1.89	1.25, 0.81, 1.93

[1] Baseline: Odds Ratio Model 1: Education adjusted for age and gender.
[2-6] Odds Ratio Models 2-6: Education adjusted for age, gender and stated Understanding Index. Each Model is compared to Baseline Model 1 to ascertain mediation effect of the CDRF Understanding Index.
[7] LRCD = Lifestyle Related Chronic Disease.

OCCUPATION

Table 4.43 examines the effect that respondents' understanding about each Chronic Disease/ Risk Factor (CDRF) has on the relationship between their Occupation and being prompted by the *Measure Up* campaign to engage in proximal behaviour change. Separate examination of each CDRF was performed in logistic regression analyses with the baseline Model 1 depicting respondents' Occupational group adjusted for age and gender. Models 2-6 included the components of Model 1 plus an additional adjustment for each CDRF Understanding Index score grouped into tertiles of High, Medium, and Low.

None of the differences between occupational groups reached statistical significance, meaning that respondents' understanding in any CDRF category had no effect on the relationship between their Occupation and whether they were prompted by the *Measure Up* campaign to engage in any of the listed proximal behaviours .

Table 4.43 The contribution of Understanding to Occupation differences in Proximal Behaviour

	Adjustment Model	Man/ Profs OR (95%) CI	White collar OR (95%) CI	Blue collar OR (95%) CI
Measure my waistline				
Model 1[1]	Age and Gender	1.00	1.00; 0.70, 1.43	0.90; 0.56, 1.45
Model 2[2]	Cancer	1.00	1.02; 0.71, 1.45	0.93; 0.58, 1.51
Model 3[3]	LRCD[7]	1.00	1.06; 0.74, 1.52	0.94; 0.58, 1.51
Model 4[4]	Type 2 Diabetes	1.00	1.01; 0.71, 1.45	0.91; 0.56, 1.46
Model 5[5]	Heart Disease	1.00	1.02; 0.72, 1.46	0.93; 0.58, 1.50
Model 6[6]	Overweight	1.00	1.04; 0.72, 1.48	0.93; 0.58, 1.50
Weigh myself				
Model 1[1]	Age and Gender	1.00	0.94; 0.66, 1.32	1.25; 0.80, 1.97
Model 2[2]	Cancer	1.00	0.94; 0.67, 1.33	1.28; 0.82, 2.02
Model 3[3]	LRCD	1.00	0.97; 0.68, 1.36	1.29; 0.82, 2.03
Model 4[4]	Type 2 Diabetes	1.00	0.94; 0.67, 1.32	1.26; 0.80, 1.97
Model 5[5]	Heart Disease	1.00	0.93; 0.66, 1.32	1.27; 0.81, 2.00
Model 6[6]	Overweight	1.00	0.95; 0.67, 1.34	1.28; 0.82, 2.01
Increase physical activity				
Model 1[1]	Age and Gender	1.00	1.21; 0.86, 1.71	1.18; 0.75, 1.84
Model 2[2]	Cancer	1.00	1.21; 0.86, 1.71	1.17; 0.75, 1.84
Model 3[3]	LRCD	1.00	1.24; 0.88, 1.75	1.19; 0.76, 1.86
Model 4[4]	Type 2 Diabetes	1.00	1.22; 0.86, 1.72	1.18; 0.75, 1.84
Model 5[5]	Heart Disease	1.00	1.22; 0.86, 1.73	1.22; 0.78, 1.91
Model 6[6]	Overweight	1.00	1.21; 0.86, 1.71	1.18; 0.76, 1.85

	Adjustment Model	Man/ Profs OR (95%) CI	White collar OR (95%) CI	Blue collar OR (95%) CI *(continued)*
Increase my fruit and vegetable consumption				
Model 1[1]	Age and Gender	1.00	0.95; 0.67, 1.34	0.93; 0.59, 1.47
Model 2[2]	Cancer	1.00	0.95; 0.67, 1.34	0.92; 0.58, 1.45
Model 3[3]	LRCD	1.00	0.96; 0.68, 1.36	0.93; 0.59, 1.47
Model 4[4]	Type 2 Diabetes	1.00	0.96; 0.68, 1.36	0.94; 0.60, 1.48
Model 5[5]	Heart Disease	1.00	0.94; 0.67, 1.34	0.94; 0.60, 1.48
Model 6[6]	Overweight	1.00	0.95; 0.67, 1.35	0.94; 0.60, 1.48
Talk to my doctor about prevention of chronic disease.				
Model 1[1]	Age and Gender	1.00	1.11; 0.71, 1.75	0.85; 0.46, 1.56
Model 2[2]	Cancer	1.00	1.10; 0.70, 1.73	0.82; 0.45, 1.52
Model 3[3]	LRCD	1.00	1.11; 0.70, 1.74	0.84; 0.46, 1.55
Model 4[4]	Type 2 Diabetes	1.00	1.13; 0.72, 1.77	0.85; 0.46, 1.57
Model 5[5]	Heart Disease	1.00	1.08; 0.68, 1.70	0.85; 0.46, 1.58
Model 6[6]	Overweight	1.00	1.12; 0.71, 1.76	0.85; 0.46, 1.56

[1] Baseline Model 1: Occupational Status adjusted for age and gender.
[2-6] OR Models 2-6: Occupational Status adjusted for age, gender, and the stated Understanding Index. Each Model is compared to Baseline Model 1 to ascertain mediation effect of the CDRF Understanding Index.
[7] LRCD Lifestyle Related Chronic Disease

INCOME

Table 4.44 examines the effect that respondents' understanding about each Chronic Disease/ Risk Factor (CDRF) has on the relationship between their level of Income and being prompted by the *Measure Up* campaign to engage in proximal behaviour change.

Separate examination of each CDRF was performed in logistic regression analyses with the baseline Model 1 depicting respondents' Income level adjusted for age and gender. Models 2-6 included the components of Model 1 plus an additional adjustment for each CDRF Understanding Index score grouped into tertiles of High, Medium, and Low.

Despite significant odds of respondents with middle levels of household income being more likely to measure their waist line and weigh themselves, the mediation effect of understanding in any of the CDRF categories is minimal. Similarly, respondents with low-middle income were more likely to increase their fruit and vegetable intake and talk to their doctor than any other income level. These higher likelihoods however were mediated only minimally by CDRF understanding, with the only notable mediation effect being that in Model 5. Compared to Baseline Model 1 (OR 2.28, 95% CI 1.35, 3.85), a greater understanding of heart disease mediated the likelihood of respondents talking to their doctor about preventing chronic disease (OR 2.38, 95% CI 1.40, 4.06).

Overall however, there was very little evidence that understanding influences the association between income and being prompted by the campaign to engage in proximal behaviour.

Table 4.44 The contribution of Understanding to Income differences in Proximal Behaviour

	Adjustment Model	High OR (95%) CI	Middle OR (95%) CI	Low-middle OR (95%) CI	Low OR (95%) CI
Measure my waistline					
Model 1[1]	Age / Gender	1.00	**1.75; 1.19, 2.56**	1.37; 0.91, 2.07	1.01; 0.57, 1.81
Model 2[2]	Cancer	1.00	**1.76; 1.20, 2.59**	1.42; 0.94, 2.15	1.11; 0.62, 1.99
Model 3[3]	LRCD[7]	1.00	**1.76; 1.20, 2.58**	1.40; 0.93, 2.12	1.06; 0.59, 1.91
Model 4[4]	Type 2 Diab.	1.00	**1.77; 1.21, 2.59**	1.40; 0.93, 2.12	1.06; 0.59, 1.89
Model 5[5]	Heart Disease	1.00	**1.81; 1.23, 2.66**	1.43; 0.95, 2.18	1.07; 0.60, 1.93
Model 6[6]	Overweight	1.00	**1.74; 1.18, 2.55**	1.42; 0.94, 2.15	1.12; 0.62, 2.01
Weigh myself					
Model 1[1]	Age /Gender	1.00	**1.43; 1.00, 2.07**	1.39; 0.94, 2.07	0.94; 0.55, 1.62
Model 2[2]	Cancer	1.00	**1.44; 1.00, 2.08**	1.42; 0.95, 2.11	0.97; 0.56, 1.67
Model 3[3]	LRCD	1.00	1.43; 0.99, 2.07	1.41; 0.95, 2.09	0.97; 0.56, 1.66
Model 4[4]	Type 2 Diab.	1.00	**1.44; 1.00, 2.07**	1.40; 0.94, 2.08	0.95; 0.55, 1.63
Model 5[5]	Heart Disease	1.00	**1.47; 1.02, 2.12**	1.41; 0.95, 2.11	0.95; 0.55, 1.64
Model 6[6]	Overweight	1.00	1.43; 0.99, 2.06	1.43; 0.96, 2.13	1.02; 0.59, 1.76
Increase my physical activity					
Model 1[1]	Age / Gender	1.00	1.22; 0.85, 1.75	1.41; 0.95, 2.09	1.15; 0.67, 1.98
Model 2[2]	Cancer	1.00	1.22; 0.85, 1.76	1.42; 0.96, 2.12	1.19; 0.69, 2.05
Model 3[3]	LRCD	1.00	1.23; 0.85, 1.77	1.43; 0.97, 2.13	1.19; 0.69, 2.04
Model 4[4]	Type 2 Diab.	1.00	1.23; 0.85, 1.77	1.43; 0.96, 2.12	1.17; 0.68, 2.02
Model 5[5]	Heart Disease	1.00	1.27; 0.88, 1.83	1.46; 0.98, 2.18	1.19; 0.69, 2.05
Model 6[6]	Overweight	1.00	1.22; 0.85, 1.76	1.44; 0.97, 2.13	1.21; 0.70, 2.09

	Adjustment Model	High OR (95%) CI	Middle OR (95%) CI	Low-middle OR (95%) CI	Low OR (95%) CI *(continued)*
Increase my fruit and vegetable consumption					
Model 1[1]	Age / Gender	1.00	1.38; 0.95, 2.00	**1.53; 1.03, 2.28**	1.22; 0.71, 2.12
Model 2[2]	Cancer	1.00	1.37; 0.95, 1.99	**1.55; 1.04, 2.31**	1.27; 0.73, 2.22
Model 3[3]	LRCD	1.00	1.39; 0.96, 2.02	**1.56; 1.04, 2.32**	1.26; 0.73, 2.18
Model 4[4]	Type 2 Diab.	1.00	1.39; 0.96, 2.02	**1.56; 1.05, 2.33**	1.29; 0.75, 2.25
Model 5[5]	Heart Disease	1.00	1.41; 0.97, 2.05	**1.58; 1.06, 2.36**	1.27; 0.73, 2.21
Model 6[6]	Overweight	1.00	1.38; 0.95, 1.99	**1.55; 1.04, 2.31**	1.26; 0.72, 2.19
Talk to my doctor about prevention of chronic disease.					
Model 1[1]	Age / Gender	1.00	1.43; 0.85, 2.41	**2.28; 1.35, 3.85**	1.49; 0.71, 3.13
Model 2[2]	Cancer	1.00	1.42; 0.85, 2.39	**2.27; 1.34, 3.83**	1.50; 0.71, 3.16
Model 3[3]	LRCD	1.00	1.43; 0.85, 2.41	**2.29; 1.35, 3.85**	1.50; 0.71, 3.14
Model 4[4]	Type 2 Diab.	1.00	1.44; 0.85, 2.42	**2.33; 1.38, 3.93**	1.62; 0.77, 3.41
Model 5[5]	Heart Disease	1.00	1.55; 0.92, 2.63	**2.38; 1.40, 4.06**	1.46; 0.68, 3.11
Model 6[6]	Overweight	1.00	1.43; 0.85, 2.41	**2.24; 1.33, 3.78**	1.42; 0.67, 3.00

[1] Baseline Model 1: Income level adjusted for age and gender.
[2-6] OR Models 2-6: Income level adjusted for age, gender, and the stated Understanding Index. Each Model is compared to Baseline Model 1 to ascertain mediation effect of the CDRF Understanding Index.
[7] LRCD = Lifestyle Related Chronic Disease.

4.3.4 SOCIOECONOMIC DIFFERENCES IN PURSUIT OF ONLINE INFORMATION ABOUT THE *MEASURE UP* CAMPAIGN

In all campaign literature the audience was encouraged to go online to the *Measure Up* website to pursue information about waist measurement and the prevention of lifestyle related chronic disease. Of those respondents with access to a computer (n=746) 96.5% reported that they did not visit the website. Moreover, there was no association between SEP and use of the website (Table 4.45).

Table 4.45 Relationships between SEP and going on line to the *Measure Up* website in respondents who had access to a computer

	Had computer access (n=746)[1]				
	Did not go online (n =720)		Went online to *Measure Up* (n=26)		
Predictor	**n**	**%**	**n**	**%**	**p. value**
Education level					
Bachelor/ Higher degree	287	95.3	14	4.7	
Diploma/ Assoc. Degree	101	96.2	4	3.8	*0.479*
Certificate/Trade	120	97.6	3	2.4	
No post-school	209	97.7	5	2.3	
Occupational group[3]					
Managers/ Profs	323	96.1	13	3.9	
White collar	199	97.1	6	2.9	*0.715*
Blue Collar	84	97.7	2	2.3	
Income level					
High	221	96.9	7	3.1	
Middle	211	96.8	7	3.2	*0.918*
Low-Middle	157	95.7	7	4.3	
Low	48	96.0	2	4.0	

[1] Total population N = 845 (excluded from the original sample of 1065 are 139 respondents who were unaware of the *Measure Up* campaign, 6 who did not answer the awareness item, and 75 respondents who did not provide any socioeconomic information). Also excluded were 73 respondents who did not have access to a computer and 26 respondents who did not answer this item resulting in sample n = 746.

[2] P.value refers to differences in proportions of respondents in each socioeconomic level who did not go online.

[3] Interpretation of the Not Easily Classified (NEC) category was difficult due to the group heterogeneity and thus excluded from Chi Square analyses. The NEC group includes respondents who were studying, unemployed, permanently unable to work, retired, and engaged in home duties on a full-time basis (see profile Table 3.5).

RELATIONSHIPS BETWEEN RESPONDENTS' SEP AND NOT HAVING ACCESS TO A COMPUTER

Table 4.46 examines relationships between SEP and not having access to a computer (n=73). More than half (52.8%) of those who did not have computer access had no post school qualifications, almost one third had blue collar occupations (32.6%), and combined low-middle and low income comprised just over 64% of those without computer access. Statistically significant bivariate relationships were observed between education (p=0.001), occupation (p=0.001), household income (p< 0.001), and not having access to a computer.

Table 4.46 Relationships between SEP and not having access to a computer

SEP Predictor	Did not have computer access (n = 73)[1]		
	n	%	*p.value*
Education level			
Bachelor/ higher degree	14	19.4	
Diploma/ Assoc. Degree	7	9.7	
Certificate/ Trade	13	18.1	
No post-school qualifications	38	52.8	
			p=0.001
Occupational group[2]			
Managers/ Profs	12	26.1	
White collar	19	41.3	
Blue Collar	15	32.6	
			p=0.001
Income level			
High	12	21.4	
Middle	8	14.3	
Low-Middle	20	35.7	
Low	16	28.6	
			p<0.001

[1] Total population N = 845 (excluded from the original sample of 1065 are 139 respondents who were unaware of the *Measure Up* campaign, 6 who did not answer the awareness item, and 75 respondents who did not provide any SE information). 746 respondents had access to a computer, and 26 respondents did not answer this item resulting in sample n = 73.

[2] P. value relates to differences in proportions of respondents in each socioeconomic level who did not have access to a computer.

[3] Interpretation of the Not Easily Classified (NEC) category was difficult due to the group heterogeneity and thus excluded from Chi Square analyses. The NEC group includes respondents who were studying, unemployed, permanently unable to work, retired, and engaged in home duties on a full-time basis (see profile Table 3.5).

4.4 CHAPTER SUMMARY

This chapter has presented all major findings in the main survey in a format consistent with the RUE model and addressing the three research questions. A summary of these main findings follows.

4.4.1 RESULTS ADDRESSING RESEARCH QUESTION 1: *What is the relationship between SEP and reach in mass media health promotion campaigns?*

- In terms of all socioeconomic indicators, education, occupation and income, respondents of low SEP were significantly less aware of the *Measure Up* campaign advertisements than their higher socioeconomic counterparts.
- The least educated respondents had the lowest media channel exposure via posters in bus shelters, and by newspapers and magazines. Respondents with Certificate/ Trade level education were significantly less exposed by posters at shopping centres. Those with Blue and White collar occupations were significantly less likely to be exposed at bus shelters, and White collar occupations significantly less likely at shopping centres.
- Respondents who had a Low-middle level of yearly household income were exposed to significantly fewer media channels than were those with a High household income.

4.4.2 RESULTS ADDRESSING RESEARCH QUESTION 2: *What is the relationship between SEP and understanding of mass media health promotion campaign message and language?*

- In 4 of 5 items about Cancer, the highest statistically significant odds of having incorrect responses are for those in the lowest socioeconomic groups indicated by education, occupation or income. In the fully SEP adjusted models, respondents of the lowest SEP in education and yearly household income have significantly lower overall understanding of the term ‘Cancer’.
- In 8 of 10 items about Lifestyle Related Chronic Disease, the highest statistically significant odds of having incorrect responses are for those in the lowest socioeconomic groups indicated by education, occupation or income.

In the fully SEP adjusted models, respondents of the lowest SEP in education have significantly lower overall understanding of the term ‘Lifestyle Related Chronic Disease’.

- In 11 of 14 items about Type 2 Diabetes, the highest statistically significant odds of having incorrect responses are for those in the lowest socioeconomic groups indicated by education, occupation or income. In the fully SEP adjusted models, respondents of the lowest SEP in education, and yearly household income have significantly lower overall understanding of the term ‘Type 2 Diabetes’.
- In 9 of 9 items about Heart Disease, the highest statistically significant odds of having incorrect responses are for those in the lowest socioeconomic groups indicated by education, occupation or income. In the fully SEP adjusted models, respondents of the lowest SEP in education, and yearly household income have significantly lower overall understanding of the term ‘Heart Disease’.
- In 8 of 11 items about Overweight and large waistline, the highest statistically significant odds of having incorrect responses are for those in the lowest socioeconomic groups indicated by education, occupation or income. In the fully SEP adjusted models, respondents of the lowest SEP in education, and yearly household income have significantly lower overall understanding of the term ‘Overweight’.
- Throughout the survey, relationships between SEP and knowledge and understanding of the main campaign message regarding waist measurement and overweight were examined by 8 items. A summary of these specific results showed overwhelmingly that respondents in the lower socioeconomic groups had the highest proportions of incorrect scores and the highest age and gender adjusted odds of having an incorrect answer in each item.

4.4.3 RESULTS ADDRESSING RESEARCH QUESTION 3: *What is the relationship between SEP and effectiveness of mass media health promotion campaign messages in terms of proximal behavioural response?*

- Respondents with a Diploma or Associate Degree level of education were significantly more likely than the Bachelor or higher degree referent group to report that they increased their physical activity in response to the campaign messages (OR 1.66; 95% CI 1.08-2.55), and to increase their fruit and vegetable intake (OR 1.83; 95% CI 1.19-2.83). Those in the Middle Income groups were significantly more likely than the High Income referent group to report measuring their waist. Low-middle income groups were significantly more likely than those with High Income to increase their fruit and vegetable intake (OR 1.53; 95% CI 1.03-2.28), and talk to their doctor about prevention of chronic disease (OR 2.28; 95% CI 1.35-3.85).

RELATIONSHIPS BETWEEN UNDERSTANDING AND EFFECTIVENESS

- Respondents with low overall understanding of the terms 'Cancer', 'LRCD', 'T2 Diabetes', and 'Overweight' were significantly less likely than those with a high level of understanding to measure their waist. Those with low understanding of the term 'Overweight' were significantly less likely to measure their weight. Those with low understanding of the term 'Type 2 Diabetes' were significantly less likely than those with high levels of understanding to increase their fruit and vegetable consumption. Those with a medium level understanding of the term 'Heart Disease' were 45% <u>more</u> likely than those with a high level of understanding to increase their physical activity and 150% <u>more</u> likely to talk to their doctor about preventing chronic disease with both odds reaching statistical significance. There was very little evidence that the effects of understanding differed by SEP.
- There was very little evidence that understanding influences the association between SEP and being prompted to engage in proximal behaviours.

- Highly significant associations were observed between SEP and computer access, with those from disadvantaged backgrounds having the lowest reported access.
- The majority of respondents in all socioeconomic groups had access to a computer (n=746), but of these, there were insufficient numbers who went online to the *Measure Up* website (n=26) to proceed to further analysis.
- There was very little difference among SEP groups in the percentages of participants who had access to a computer but did not go online.

The findings of this chapter have demonstrated that when compared to their higher socioeconomic counterparts, low socioeconomic groups experience significantly lower Reach and Understanding of mass media health promotion campaign information. In terms of Effectiveness or being prompted by the *Measure Up* campaign to engage in recommended proximal behaviours, those with a Diploma or Associate degree level of education, or a middle level or low-middle level household income had significantly higher odds of being prompted to engage in some proximal behaviours. Understanding was found to influence respondents being prompted to engage in proximal behaviours but this did not differ by SEP. In Chapter 5 the findings presented in this chapter will be discussed in light of previous research that has explored differential socioeconomic response to mass media health promotion campaigns.

Chapter 5: Discussion

5.0 INTRODUCTION

This study investigated the support for claims that mass media health promotion campaigns inadvertently widened socioeconomic inequalities in health. As such, it aimed to determine whether the population response to mass media health promotion campaigns in terms of reach, understanding and effectiveness, differed by respondents' SEP. The second aim was to examine whether respondent understanding of campaign language and messages was associated with socioeconomic differences in early (proximal) behavioural response.

The chapter is organised into five sections that begin with a discussion of results presented within the Reach, Understanding, and Effectiveness (RUE) framework in line with other chapters. The second section discusses the strengths and limitations of the present research, whilst section three suggests directions for future research. In section four implications of the research and associated recommendations are presented, and section five concludes the chapter.

The importance of this investigation lies in the continuing and unjust health inequalities experienced by lower socioeconomic groups. These inequalities manifest as higher prevalence and incidence of risk factors, and higher morbidity and mortality rates for (avoidable) lifestyle related chronic disease (AIHW, 2008; Lynch et al., 1997; WHO, 2010). This injustice is compounded by findings that mass media health promotion campaign information may not reach, be understood by, nor be as effective in those most in need (Kawachi & Marmot, 1998). Such comparative ineffectiveness at the population level for lower socioeconomic groups it is thought may generate inequalities and contribute to the widening health inequality gap between these groups. There was, however, little compelling evidence supporting these claims and the methodological rigour of studies that evaluate campaign development and outcomes has been questioned in systematic reviews (Guillaumier et al., 2012).

The review conducted prior to the current study included mass media health promotion campaign evaluation literature that spanned two decades and specifically addressed risk factors for lifestyle related chronic disease, including low physical activity, low consumption of fruit and vegetables, and weight gain. As is often the case, a large number of papers are found using the references of other papers and I used terms such as 'exercise' and 'diet' in my ongoing searching.

The findings of the review indicated that the existence of inequality was poorly described. There was minimal reporting of differential socioeconomic response and mixed and inconclusive outcomes generated little confidence in the direction of socioeconomic differences. It was also found that in many cases socioeconomic data were mainly used to control the confounding effects of SEP, or to describe the sample. Such limited use of socioeconomic data suggests a lack of conviction to ascertaining the real success of campaign outcomes across the population.

Many of the studies reviewed were also notable for a lack of methodological consistency and rigour in evaluation methods. Mixed results in terms of socioeconomic differences in responsiveness to mass media campaign messages have also been found in evaluation studies of anti-tobacco campaigns, where it has been suggested that weak designs and selection bias may account for the inconsistent evidence (Guillaumier et al., 2012).

Confirmation of mass media effectiveness in low SEP populations suffers from a paucity of studies that evaluate mass media campaigns from a socioeconomic perspective using consistent methods. Such a lack of evidence and evidence quality has led to the current research which seeks to more clearly establish the relationship between mass media campaign outcomes and SEP.

5.1 DISCUSSION OF RESULTS

Results of the current study are discussed in the light of previous research that has explored differential socioeconomic response to mass media health promotion campaigns. The discussion is organised using the RUE framework domains similarly to previous chapters.

5.1.1 SOCIOECONOMIC DIFFERENCES IN *MEASURE UP* CAMPAIGN REACH

5.1.1.1 CAMPAIGN AWARENESS

In the current research, I aimed to ascertain the proportion and characteristics of respondents who were not aware of the *Measure Up* campaign. This campaign had recently finished its second intensive ‘flight’ of television broadcasting and was at the time of the survey, being delivered by ‘still’ posters at bus shelters and on shopping trolleys, and by newspapers and magazines. One hundred and fifty of the people surveyed (14.2%) reported that they were unaware of the campaign, and by all SEP indicators lower socioeconomic groups comprised the highest proportions of these. Respondents with certificate/trade or no post school qualifications, blue collar occupations and those living in low income households, were twice as likely to be unaware of the campaign than their higher socioeconomic counterparts.

Of the 12 campaign evaluations in the literature that reported reach by SEP, only two (Buchthal et al. 2011 & Wardle et al. 2001) concurred with the current study finding across all measured SEP indicators. Lower socioeconomic groups were less likely to be aware than their higher socioeconomic counterparts. As well, both studies were similar in aspects of design to the current study, sharing the features of prompted awareness and determination of the media channel by which respondents were exposed. It may be that the design features of prompting awareness, such as with a campaign image and respondents’ reports of media channel to which they were exposed to the campaign, might promote greater focus and thus make their response more reliable as a result.

The diversity of results in the remaining 10 studies may be the result of a number of factors. Differing study designs, different measures of awareness, confusion regarding terminology about ‘prompted’ and ‘unprompted’ recall’ (Leavy et al., 2011), and the confounding influence of other unmeasured factors. For example, at the campaign level, in the *'Piece of String'* study by Morley et al. (2009) the results were mixed. Awareness was highest in the least educated and in those not working, but lowest in lower IRSAD (Index of Relative Socioeconomic Advantage and Disadvantage in which a low score indicates relatively greater disadvantage and a lack of advantage in general) groups, and lowest in the middle income group. It is possible that those with lower education levels are less likely to be employed full time, more likely to have more time to watch television, and thus more likely be exposed to the campaign advertisements, thus confounding the results: the highest recall rates in those not working gives support to this idea.

In the current research, with such highly significant results in mind, the question arises as to why such relatively large proportions of low SEP respondents compared to high SEP respondents were unaware of the *Measure Up* campaign? What is it about the campaign that makes it unnoticeable/unattractive to lower socioeconomic groups? Two possible influences emerge from the literature that may help in understanding this finding.

5.1.1.1.1 Socioeconomic level input in formative stages of message development

There is minimal reporting of the socioeconomic makeup of focus groups that are used in the formative stages of development of mass media health promotion campaigns. If this lack of reporting is a reflection of the lack of consideration of SEP in campaign design and development, then whether aspects of the advertising did not appeal to these groups or in fact repelled them, would not be known. Inequalities can be unintentionally built into campaigns from inception (White et al., 2009). In order to minimise this early bias, it is fundamental that focus groups or other formative data collection methods used in message development represent the socioeconomic makeup of the target audience (Bauman et al., 2006; Freimuth, et al., 2001).

Focus groups were used in the developmental stages of the *Measure Up* campaign advertisements, and the demographic details of members were reported (Bluemoon research and planning Pty. Ltd., 2007). Focus groups were also conducted in disadvantaged areas. The socioeconomic mix of the groups, however, was only defined by employment status in that representative proportions of the sample were made up of the employed, the unemployed, students, and retirees, “in groups appropriate for the purpose” (Bluemoon research and planning Pty. Ltd., 2007). Campaign outcomes, however, may be biased early in development on the basis of literacy, which is better indicated by education (Freimuth, et al., 2001). The *Measure Up* campaign may have benefited from a more precise account of the socioeconomic make-up of the focus groups that included educational level. Occupations or previous occupations were not ascertained and as such descriptions of focus group makeup provided no real information about members’ past or current SEP.

In the current research, employment status was combined with occupation and as a measure of SEP was found in comparison to education and yearly household income, to be relatively weaker predictor of socioeconomic differences. This indicates the importance of looking beyond occupation to a comprehensive assessment of SEP at focus group level. The pilot study for this research included feedback about the questionnaire from participants of a representative spread of education and income levels, and in the main survey, campaign response was evaluated in socioeconomic terms determined by education, yearly household income, and occupation. Education and income proved repeatedly to be the most sensitive and predictive indicators.

5.1.1.1.2 Socioeconomic aspects of gaining audience attention

Another factor possibly influencing decreased awareness of lower SEP groups is that of gaining this group’s attention. In the current study there were minimal differences by SEP in the proportions of respondents exposed to the campaign by television. Television is known as a medium that serves all socioeconomic levels for health promotion, unlike print media (Reid, 1994). As such, television advertisements must be designed to have maximum effect across these levels (Dixon et al., 1998). As of September 2009, 99% of Australian households had at least one television set (Screen Australia, 2013). The current study findings concur with the results of Buckthal et al. (2011) from the ‘*Start. Living. Healthy’* campaign in Hawaii. The authors found no significant differences by education or income in respondent exposure to campaign information by television. Hence, it would seem that there is no loss of reach to lower socioeconomic groups by way of the medium of television. It may be that the differences in reach by SEP are partly explained by exposure via other media channels.

5.1.1.2 MEDIA CHANNEL EXPOSURE

The current research found generally that compared to higher socioeconomic groups, lower socioeconomic groups by education and occupation, were significantly less likely to be exposed to campaign information by still posters at shopping centres and bus shelters. These results concurred with those of van der Pal-de Bruin et al. (2003) in the Dutch folic acid studies that found lower educated respondents had significantly lower exposure by still posters in bus shelters. The current study also found that respondents with low education were least likely to be exposed to campaign information by newspapers and magazines, concurring with the findings of a Mediterranean study by Holgado et al. (2000). It may be that lower socioeconomic groups are least attracted by text and more likely to notice images that require minimal additional reading. If this is the case, then it is of great importance that the language and images used attract attention across the entire socioeconomic spectrum, particularly at the more disadvantaged end.

There are few studies that measure exposure by different media channels (Randolf & Viswanath, 2004), and research for this thesis did not find any studies regarding attention to images on still posters with which to compare this finding. It might be, for example, that the healthy looking young male in white boxer shorts standing on a tape measure in the *Measure Up* campaign advertisements did not attract the attention of the respondents with a certificate/ trade level of education nor respondents in white collar occupations, without the spoken dialogue of the similar television commercial. As well, the health language used on the posters “Are you on your way to chronic disease?” may not have had meaning and not been remembered by some respondents.

5.1.1.2.1 Multiple media channel exposure

In the current study a media channel exposure index was used to explore SEP differences in the number of information sources to which each respondent was exposed. The only significant indicator of low total media channel exposure was in the low-middle income group (after adjustment for age, gender, education and occupation); respondents in this group were exposed to significantly fewer media channels than was the high income group. There is a paucity of studies reporting the number of media channels to which audience members are exposed. However, the current research concurs with a study evaluating the Dutch Folic Acid campaign study (van der Pal-de Bruin et al., 2003), in which women with lower education reported being exposed to fewer media channels than did women with higher education.

Maximum exposure is essential for campaign success, and one of the reasons proffered is the 'notion of social expectation' suggested by Hornik and Kelly (2007). Being exposed to campaign information by multiple media channels can give the impression that different sources are of the same opinion and everyone is thinking the same thing; thus a perception of credibility is created about a message (Hornik & Kelly, 2007).

One factor that might have influenced the amount of attention given to the still posters is the idea of Natharius (2004) that 'the more we know, the more we see'. When applied to the still poster advertising images in the *Measure Up* campaign, the man standing on a tape measure and at the same time measuring his waist may have little meaning for persons who do not have the necessary background knowledge to make the connection between the tape measure, weight gain, weight measurement and chronic disease. This health literacy may be determined by education and hence lacking in some groups. The results about understanding overweight and waist-measurement reported in the latter part of Chapter 4 support this hypothesis.

In terms of McGuire's Communication/Persuasion model, gaining audience attention to a message is a very early essential step in the communication process (McGuire, 1989). Gaining this attention is integral to awareness of a campaign, and SEP may influence whether an individual is stimulated to take notice of an image. According to Tichenor's "Knowledge Gap" hypothesis, information diffused through a population is more likely to be recalled and remembered by higher than lower socioeconomic groups (Tichenor et al., 1970), but later investigators in this area (Ettema et al., 1983) found that the salience, locality, and relevance of the subject matter to the individual tended to narrow the knowledge gap across socioeconomic groups.

5.1.1.3 TARGETING OF POPULATION SUB-GROUPS

Intrinsically connected to salience and relevance of the subject matter is the manner in which population sub-groups are targeted. I am suggesting here that there is a fine line between the targeting of specific groups to increase the likelihood that they are being reached by the message, and targeting so specifically that the sub-group is singled out to be different.

Population sub-groups may not want to be singled out and made to look different, especially if defining the sub-group in a particular way has comparatively negative connotations. Targeting of lower socioeconomic groups may have the effect, or perceived effect, of reinforcing a stereotypical picture, and of suggesting that the group has different characteristics to those of middle and higher socioeconomic groups. To make an obvious target of a group by either singling the group out as different or by exclusion from the images in the advertisements (as may have been the case in the *Measure Up* campaign) could turn people away. In addition, people in a targeted group may be offended because either they do not see themselves as part of a group that needs special targeting, or they do not relate to the image portrayed in the campaign. The images and language in the campaign advertising may be perceived as foreign and irrelevant and not be comprehended. As a result, they are not noticed by some groups and if they are noticed they may not be retained to the extent that the campaign message is recalled or seen via a particular type of exposure.

It has been well established that groups of lower SEP have different literacy and health literacy needs (ABS, 2006), but these needs might be better addressed in advertisements that use images inclusive of all socioeconomic groups and use language that is easily understood by persons of all socioeconomic levels. This idea has been broached in other studies, such as one that examined the advertising for an Australian campaign to promote cervical screening (Anderson et al., 2009). That campaign, which was conducted in the state of Victoria, aimed to prompt women who were overdue for their Pap smear cervical screening test to have it done. Campaign images comprised the seated legs of women of a broad age range, and the clothing that the women wore suggested that they were from a range of socioeconomic groups (Anderson et al., 2009). The advertisements did not single out any socioeconomic group and the language of the message was simple, *"Don't just sit there"*.

Another study that suggested that population subgroups may not need to be singled out examined anti-smoking campaigns in another population sub-group, the Australian Aborigines. The study evaluated Aboriginal peoples' responses to television and radio anti-smoking advertising (Boyle, Shepherd, Pearson, Monteiro, McAullay, Economo, et al., 2010). The authors reported that aboriginal and non-aboriginal audiences responded similarly to the mainstream (non-targeted) anti-smoking campaign advertisements.

Further support for the idea that sub-groups may respond less to being singled out come from the findings of Puhl, Peterson and Luedicke (2013a), who reported on perceptions of the US public to obesity-related health promotion messages. The authors suggested that individuals' respond better to positive messages, such as increasing fruit and vegetable consumption and other health behaviours, than they do to messages that stigmatise obesity. In addition, the authors found that stigmatising messages were less well received in terms of motivation, and in fact found that these messages bring about reduced self-efficacy for behaviour change than messages that are neutral or less stigmatising (Puhl et al., 2013b). Whilst it could be argued that this problem might be felt across all subgroups, the highest prevalence of overweight and obesity is found among the least educated and those with low incomes (ABS, 2011).

In summary, the present study showed clearly that lower socioeconomic groups defined by education, occupation and yearly household income, comprised the highest proportions of those unaware of a mass media campaign. A commitment to reaching all societal sub-groups with health information must begin by underpinning all stages of campaign development and implementation with a theory-based model. Television was the major media channel by which most respondents became exposed to the campaign material; hence, advertisements via this mode must attract the attention and be immediately understood at all socioeconomic levels. Not previously detected in the literature, this study found that lower SEP groups are less likely to be exposed to still posters in shopping centres. Perhaps this could be the effect of the slightly cryptic campaign tagline on these posters, “Are you on your way to chronic disease?” that made them less understandable, or perhaps the depiction of an overweight person on a tape-measure was offensive to some or just did not attract attention. Finally, this study’s finding that lower socioeconomic groups are exposed to fewer media channels than are the high income group, highlights the importance of both delivering advertisements through media channels that lower socioeconomic groups use, and of making these advertisements attractive and easily understood.

5.1.2 SOCIOECONOMIC DIFFERENCES IN UNDERSTANDING THE *MEASURE UP* CAMPAIGN MESSAGE AND LANGUAGE

There is very little evidence that the health related language used in mass media health promotion campaigns is understood by all societal groups defined by SEP. In this section I discuss how the current study and literature reviewed for this thesis supports this idea. Respondents’ knowledge and understanding of the medical terminology used in the *Measure Up* campaign was determined initially by a set of knowledge items about chronic disease risk factor (CDRF) terminology, followed by the calculation of an Understanding Index comprised of the total number of correct answers in each CDRF set.

Determining comprehension of a campaign message is part of the message development phase of a campaign (Bauman, 2002), and thus ensuring that the message is understood at all socioeconomic levels should be established at this point.

Very few campaigns, however, are found to report the socioeconomic make-up of the developmental phase of campaigns (see Table 2.1). This important developmental step of comprehending the content of a campaign (McGuire, 1984) should be ensured early on, and should be established for evaluation as an end point, the extent to which all exposed groups understand the language and the message. If this is not done it is difficult to establish whether the campaign communicated the information to those most in need (McGuire, 1984).

In all CDRF areas, lower socioeconomic groups (in the main determined by education level and yearly household income) gave more incorrect answers than the highest SEP group, and thus they had the highest odds of having an incorrect answer compared to the highest socioeconomic referent group. These results lead to an important finding in this study, specifically, the significantly low aggregate understanding in low socioeconomic groups, of knowledge related to obesity, overweight, and the waistline measurement. These analyses included only participants who were aware of the *Measure Up* campaign so is likely an underestimation of the true proportions of incorrect answers that would be found if those who were unaware of the campaign had been included. Hence, these comparatively poorer results for lower socioeconomic groups across all 8 items related to the main focus of this campaign is worthy of mention.

The Understanding Index items covered knowledge of increased risk for Type 2 Diabetes with excess weight around the waist, and increased risk of lifestyle related chronic disease (LRCD) with large waistline measurement. Also covered was (1) knowledge about the meaning of having a large waistline, such as too much fat in the abdomen, an energy imbalance, and that fat coats the internal organs, and (2) knowledge about actions that should be taken to reduce or to prevent a large waistline, such as eating fewer snacks and take away foods and being moderately physically active for at least 30 minutes at least 5 days per week. These issues are all pertinent to the understanding of major health issues in the Australian community today.

The total cost of obesity in Australia in 2008 was estimated at $8.3 billion (Access Economics, 2008). This is an avoidable cost that includes physical health related costs, loss of productivity and psychological and social costs (National Preventive Health Taskforce, 2008). Lower SEP groups bear the highest incidence of overweight and obesity (AIHW, 2010), and thus addressing the relative deficit in knowledge is important for health promotion targeting. Fewer persons in these groups are being reached, and in social justice terms, those who most need the knowledge (a major predicator for behaviour change (McGuire, 1984)) do not seem to be acquiring it. This deficit in health knowledge will further contribute to health inequality.

5.1.2.1 Understanding of the campaign language and message

The current study provides a comprehensive assessment of knowledge about the disease or risk factor, health effects, and healthy behaviours that promote prevention. In fully SEP-, age-, and gender-adjusted models, respondents with the lowest education had the lowest overall understanding of the term ‘lifestyle related chronic disease’, and those with the lowest education and the lowest income had the lowest overall understanding of the terms ‘Cancer’, ‘Type 2 Diabetes’, ‘Heart Disease’, and ‘Overweight’. For the eight items that tested knowledge about the campaign’s message about waist measurement and overweight, lower socioeconomic groups attained the highest proportions of incorrect scores and the highest age- and gender-adjusted odds of having an incorrect answer.

There have been few studies that have evaluated respondent understanding (or knowledge, comprehension, perception or similar terms) of healthy lifestyle campaign messages and even fewer that have evaluated respondent understanding by socioeconomic position. The VERB campaign, although aimed at increasing activity in children, is one such study. Evaluators of this campaign used participant understanding of the VERB message as a major component of the outcome measures (Huhman, et al., 2007). Questions to the participating children were open ended such as “What is VERB all about?” and “What ideas does VERB give you?” Understanding of at least one campaign message was achieved by 96% of exposed children, and was highest in lower socioeconomic groups determined by parents' education and income (Huhman, et al., 2007).

The current study achieved quite different results to the VERB campaign and comparison is difficult. The campaigns differ in that the *Measure Up* target audience is much older, the campaign length is shorter, and the message is more complex and less brief than VERB. As well, the evaluation design differs in that telephone interviews were used to evaluate VERB, and as such the interviewer had an opportunity to ask open ended questions to assess understanding, whereas the current study was limited by the written survey method that was used.

Of the campaigns that have targeted healthy lifestyle issues for adults and evaluated understanding, one that stands out is a study by Pollard et al (2007) that assessed respondents' knowledge of fruit and vegetable recommendations and followed with a question that determined understanding. Participants were asked whether they perceived that they needed to increase their intake judged by their self-reported consumption, thus applying their remembered knowledge and demonstrating their understanding (Forehand, 2005; McGuire, 1989). Unfortunately, in the evaluation by Pollard et al. (2007) the authors did not report any socioeconomic information, so it was not possible to ascertain if all groups benefited from the campaign.

Three studies were found that evaluated understanding of a mass media campaign by SEP. The first, by Wardle et al (2001), implied, but did not say, that remembering the campaign message was akin to understanding. This was not a strong measure of understanding as it only involved recall of the message rather than what it meant; however, the authors reported that the least educated and lower social class were less likely to remember the campaign message about tackling weight problems with small, permanent changes in the diet rather than short-term dieting (Wardle et al., 2001). The second study classified participants as 'knowledgeable' if they could report all three elements (frequency, intensity and degree of effort) of a complex message about physical activity recommendations (Hillsdon et al., 2001). This is a much stronger measure, and researchers reported significant increases in knowledge after the campaign but minimal difference between the social grades. The third study, published within the last month, evaluated participant knowledge and perceptions pre and post the *Measure Up* campaign (King, Grunseit, O'Hara & Bauman, 2013). Seven items measured knowledge recall, for two items there was a decrease in knowledge, and in five there was an increase with three achieving statistical significance. Of the six items about perception of lifestyle and chronic disease prevention, only one broached understanding of the concept, namely that of the participant indicating the importance of maintaining a healthy weight to prevent chronic disease. Change in this perception from pre to post campaign was measured on a 0-10 scale and no change was reported.

More importantly, in terms of eliciting differences in knowledge by SEP, only one item was reported in socioeconomic terms. There was a highly significant increase in the knowledge of the correct "waist measurement associated with the risk of chronic disease …" for both women and men from pre to post campaign, but there was no significant difference between groups defined by education, employment status, or yearly household income (King et al., 2013).

The current study evaluated knowledge and understanding of campaign health language and message more extensively, and in a manner that comprehensively related the obesity/waistline message to chronic disease risk factors. It found significant differences by SEP in knowledge and understanding of the health message.

5.1.2.2 Summary

In summary, the current research has shown that persons in lower socioeconomic groups have less understanding about how to make lifestyle changes to prevent chronic disease and why they should make those changes. Increasing public knowledge and understanding of health issues can have positive effects on population health. Kenkel (2010) cites the lessons learned from increasing scientific information to the public about the detrimental health effects of tobacco. The prevalence of smoking in adults fell from almost 50% in the 1940s to about 20% at the current time, when almost all US health consumers know the relationship between smoking and lung cancer, cardiovascular, respiratory, and other serious health conditions. The lack of access to resources, such as knowledge about how to avoid risks and minimise disease, is suggested by Link and Phelan (1995) to be a fundamental cause of health inequalities by way of different levels of education. Research shows that consumers and population subgroups want to understand more about what they are advised to do. Illustrating this need to understand campaign messages is an excerpt from some qualitative reflections on the Western Australian Go for 2&5 campaign. Carter et al. (2010) cited a participant quote, "We're not told why – we're just told", thus illustrating that participants want to understand why it is 2 fruit and not 1 and why it is 5 vegetables and not 3, that are recommended. They wanted explanation and enough information to make a choice themselves (Carter et al., 2010). Numbers comprising focus groups for Carter's study were set by gender, age, and SEP and thus can be assumed to well represent the population. Government reports as well are noting 'priority areas for action' to include health promotion messages that are most likely to reduce risk factor prevalence in socially disadvantaged groups (National Preventative Health Taskforce, 2010). It has been suggested that socioeconomic status influences a person's perception of what is important to them, but for health information, all persons can be reached if the issue is communicated and perceived as relevant and motivating (Yows, Salmon, Hawkins, & Love, 1991). For this to happen, consumers must understand the message.

5.1.3 SOCIOECONOMIC DIFFERENCES IN EFFECTIVENESS OF THE *MEASURE UP* CAMPAIGN MESSAGES

In line with what is seen as possible for mass media campaigns to achieve, this section determined socioeconomic differences in campaign effectiveness by measuring campaign influence on simple behaviours (Brown, 1996). Whilst the main behaviour that the campaign promoted was waist measurement, other proximal behaviours, namely measuring weight, increasing fruit and vegetable consumption and physical exercise, and talking to the local doctor about preventing chronic disease were all behaviours encouraged by the *Measure Up* campaign (ABHI, 2008). Also discussed are outcomes of prompting campaign audiences to go online to the *Measure Up* website.

5.1.3.1 BEING PROMPTED TO ENGAGE IN PROXIMAL BEHAVIOURS

Two pathways were explored in determining socioeconomic differences in respondents being prompted by the *Measure Up* campaign to engage in proximal behaviours. The first, pathway [a] (Figure 4.1) explored relationships between SEP and being prompted to engage in each of the proximal behaviours.

5.1.3.1.1 Relationships between SEP and being prompted to engage in proximal behaviours

The current study found statistically significant odds of respondents with middle levels of income, compared to those with a high income level, being prompted to measure their waist and weight. As well, those with low-middle levels of income were prompted to increase both fruit and vegetable intake, and talk to their doctor about preventing chronic disease. Comparison of these results with published literature is difficult with little evidence of short-term behavioural response to mass media campaigns that tackle obesity (Beaudoin, 2007; Morley et al., 2009), and also with such little reference made specifically to middle socioeconomic groups. The recent evaluation of the *Measure Up* campaign that was conducted in the state of New South Wales (NSW) by King et al. (2013), however, found that those who had graduated from high school (middle education group) and those who had a degree or higher (higher education group) were significantly more likely than those with less than 12 years of education (low education group), to have "measured their waist in the last 6 months". Conversely, the King et al. study (2013) also found that those who were employed were significantly less likely to measure their waist than the unemployed. Interestingly though not significant, the higher income group in the King et al. (2013) study were less likely to have measured their waist in the last 6 months compared to the lower income referent group, a finding that tends to concur with the results of the present study in which all income groups were more likely (Middle income significantly more likely) to measure their waist than the high income group. King et al. (2013) did not report other behaviours promoted by the *Measure Up* campaign in terms of SEP. It appears that in socioeconomic terms in the King et al. study (2013), education was the only significant predictor of an increase in waist measuring behaviour from pre to post campaign. The employed and high income groups, after adjustment for education in modelling, were not motivated by the campaign to measure their waist. In the current study, middle income appears to be the only significant predictor of prompting respondents to measure their waist

There are a number of factors that should be considered as possibly contributing to the findings of the current study. Information delivered by mass media is mediated by SEP (Viswanath & Emmons, 2006), and if the information is relevant and salient (Ettema et al., 1983), it has been shown to close as well as open gaps between higher and lower educated audiences. Viswanath et al. (2006b) have also shown that heavy media coverage can reduce knowledge gaps between SEP groups. It may be that the *Measure Up* campaign advertisements appeared more personally relevant to, and gained the attention of, respondents from middle SEP groups rather than higher or lower SEP groups. In addition, it may have been that images portrayed in the *Measure Up* campaign did not particularly depict persons of higher socioeconomic level nor persons of low socioeconomic level, but that framing tended towards middle socioeconomic level. As such, the images were relevant to those of middle SEP and this was reflected in the results.

One other mass media campaign evaluation study that found a relationship between middle SEP and behaviour change was that of Miles et al. (2001) who evaluated the BBC's *'Fighting Fat, Fighting Fit'* campaign in a UK population. Significant reductions in fried food intake in respondents with lowest and middle Deprivation Indices (comprised of education level, car and home ownership) were found compared to a non-significant reduction for those with the highest deprivation index score.

5.1.3.1.2 Relationships between the Understanding Indexes and being prompted to engage in Proximal Behaviours

Correct answers in each CDRF set of items were summed to form the understanding indexes. Respondent indices for each CDRF were divided into tertiles with the lowest tertile representing the lowest index scores (which in turn represented the least aggregate knowledge). Respondents with index scores in the lowest tertile for understanding Cancer, LRCD, Type 2 Diabetes, and Overweight were all significantly less likely than those in the highest tertile to be prompted to measure their waist. Those with scores in the lowest tertile for understanding of Overweight were significantly less likely to be prompted to weigh themselves and those with index scores in the lowest tertile of understanding for Type 2 diabetes were least likely to be prompted by the campaign to increase their fruit and vegetable intake. These results suggest that lower levels of understanding are associated with a reduced likelihood of being prompted to engage in the behaviours. These scores did not differ by SEP when examined by education level, occupation, or yearly household income.

Finding no difference between SEP groups was unexpected but not unlike the findings of Hillsdon et al. (2001) in England's *"Active for Life"* campaign. The authors of that campaign evaluation reported minimal differences between socioeconomic groups in change in knowledge about physical activity recommendations and also found minimal improvement in physical activity behaviours in general and between SEP groups in particular (Hillsdon et al. 2001). The current research differed in that it detected significant changes in prompting of some behaviours but the changes did not differ by SEP.

Other authors (Viswanath et al. 2006b) have demonstrated that heavy media coverage can reduce SEP knowledge gaps about the link between smoking and cancer, also concurring with early work by Ettema et al. (1983) that the salience of the information to the audience can reduce knowledge gaps between SEP groups. Viswanath et al. (2006b) refer to knowledge about the link between smoking and cancer whereas Ettema et al. (1983) refer to knowledge about the link between sun exposure and skin cancer to African American audiences.

5.1.3.1.3 Does Understanding mediate SEP engagement in proximal behaviours?

In the second pathway of the model, pathway [b], analyses explored whether understanding, as indicated by each CDRF understanding index, mediated respondents' being prompted to engage in proximal behaviours. One of the original ideas underlying this thesis was that understanding about lifestyle related chronic disease and CDRF related terminology would mediate the relationship between SEP and being prompted to engage in behaviours promoted by the campaign. This was not found in this study. There were some very minor socioeconomic differences but no convincing evidence of a mediation effect by understanding.

A reason for such unexpected results may be the low specificity in the proximal behavioural response item. Responses to this item might have been more precisely discriminated with a third response option of 'I already do' (engage in this behaviour). A third option would have enabled respondents to indicate that they were not prompted by the campaign to engage in the behaviour because they already knew their waist measurement, knew their weight, had increased their fruit and vegetable consumption, or increased their exercise without being prompted by the campaign to do so.

These outcomes may also have been influenced by the 'socially desirable response bias' (van de Mortel, 2008), in which the tendency of respondents to present themselves in a socially desirable manner may generate artificial correlations, or may moderate real correlations in the data (King & Bruner, 2000). No literature was found that showed socially desirable response bias to be more likely in any socioeconomic group.

5.1.3.2 Being prompted to go online to the *Measure Up* website

Another behaviour promoted by the *Measure Up* campaign was that of pursuing further campaign information online at the *Measure Up* website. Because respondents would need to have access to a computer to engage in this behaviour, one of the options in the survey item asked "Did the *Measure Up* campaign prompt you to go online to the *Measure Up* website?" Respondents were able to tick the option "No, I don't have access to a computer". Strong, significant associations were observed between respondents' SEP and not having access to a computer. In those who did not have access (n=73), the highest proportions of respondents had no post-school education, blue collar occupations, or low income. Consistent with the literature (Morrell, Mayhorn, & Bennett, 2000; Ybarra & Suman, 2006), having high school or less schooling and lower income are strongly associated with not using the World Wide Web.

Most respondents in all socioeconomic groups had access to a computer (n=746), but only a relative few went online to the *Measure Up* website (n=26). Respondents who had access but did not go online did not differ proportionally by SEP. This finding is not consistent with literature that suggests that access to online information can be impaired by low education and income levels (Cotten & Gupta, 2004). Given the results of this study regarding access or not to a computer, it may be physical access that limits individuals going on line rather than a lack of computer skills. Another reason that could explain these findings might be the increasing use of technology at all levels of society as discussed in the next section.

5.1.3.2.1. The increasing use of online media across socioeconomic groups

The lack of significant socioeconomic difference in proportions of respondents who did not go online may mean either that there were greater numbers of high SEP persons who did not go online, or fewer numbers of low SEP persons who did not go online. If this is the trend, it is contrary to US figures of a decade ago (Hesse, Nelson, Kreps, Croyle, Arora, Rimer, et al., 2005; Lenhart, Horrigan, Rainie, Allen, Boyce, Madden, et al., 2003), when lower socioeconomic groups, as defined by education and income, had lower usage of internet information than did higher socioeconomic groups (Hesse et al., 2005). However, these figures from a decade ago may no longer be relevant. The use of social media has been found to be increasing in low SEP rural women in the US (Atkinson, Billing, Desmond, Gold, & Tournas-Hardt, 2007) and is becoming firmly established across US socioeconomic groups (Korda & Itani, 2013).

In Australia, ABS (Australian Bureau of Statistics) figures for household use of internet technology still differ somewhat by education and income but have changed considerably over the last decade. Figures regarding internet access for the year 1999-2000 period are available for income only and are for 'households' accessing the internet (ABS, 2000). Proportionally, in the 1999-2000 period 10% of the lowest income households compared to 69% of highest income households accessed the internet. In the 2010-2011 period 70% of persons with year 12 or less education level accessed the internet, compared to 95% of those with Bachelor level or above. In terms of income level for the same period, 72% of persons in the lowest income group compared to 97% in the highest income group accessed the internet. Between the two time periods, the difference in the gap is 25 percentage points compared to 60 percentage points and, whilst not directly comparable, does support Korda and Itani's (2013) findings that the use of social media is permeating across all social groups.

In the current research 96.5% of respondents did not go to the website, and whilst there is research indicating that most website interactions are short-lived (Vandelanotte, Spathonis, Eakin, & Owen, 2007), what is missing is knowledge about what attracts consumers to a website in the first instance and then, whether the attraction differs by SEP. Although limited to testing college graduates, one study found personal involvement and a continuing relationship were important factors when testing audience reactions to websites (Eighmey & McCord, 1998). These findings concur with discussion earlier in this chapter regarding the image portraying personal relevance (Ettema et al, 1983) to attract interest and motivation.

5.1.4 THE CONTRIBUTION OF MASS MEDIA HEALTH PROMOTION CAMPAIGNS TO THE WIDENING GAP IN HEALTH INEQUALITY

The current study found significantly lower awareness and significantly lower knowledge/understanding in low socioeconomic groups. These two factors by themselves create gaps in knowledge and understanding as both are precursors to proximal and distal behaviour change (Krathwohl, 2002; McGuire, 1984). That proximal behaviour did not differ by socioeconomic level does not mean that there will not be a socioeconomic difference in behaviour in the long term. Similar outcomes were demonstrated in the Dutch folic acid study (de Walle & de Jong-van den Berg, 2008). With targeting, socioeconomic differences immediately post campaign were markedly reduced, but when measured three years later, the authors found significant differences in knowledge about peri-conceptual folic acid consumption between lower and higher educated women. It is not known why the lower educated groups did not retain or pass on the level of knowledge that was found in the higher educated women. So, given that awareness and knowledge/understanding will affect behaviour, gaps will increase if the factors underlying the causes of the gaps are not rectified. It must be determined as to why lower socioeconomic groups are less aware, and why lower socioeconomic groups have least, and gain least, knowledge and understanding.

5.1.4.1 Summary

There is limited literature that reports socioeconomic outcomes of mass media campaigns that combat obesity. This study found significant odds of respondents with a middle level of income, compared to those with high incomes, being prompted by the *Measure Up* campaign to measure their waist and weight, increase their fruit and vegetable consumption, and talk to their doctor about prevention of chronic disease. Reasons might include that the campaign more effectively gained the attention of, was more salient to, and had more relevance for middle income respondents. Framing of images might have had more relevance for middle SEP individuals and this was reflected in the results. There was evidence that understanding health language was associated with engagement in proximal behaviour but engagement did not differ by SEP. Whilst the majority of respondents did not go to the *Measure Up* website, there were no socioeconomic differences in this group; however, there were significant associations between respondents' SEP and not having access to a computer.

Based on the findings of this study it can be said that stand alone mass media health promotion campaigns widen gaps in the inequality of health information benefit gained by the population. Compared to respondents of higher SEP, persons of lower

SEP were significantly less aware of the health information campaign, were exposed to the campaign by significantly fewer media channels, and understood significantly less health terminology and less about the campaign message. Middle socioeconomic respondents were significantly more likely to engage in proximal behaviours whilst there were no significant behavioural responses for higher or lower socioeconomic groups. These results may reflect a campaign that attracted the attention and motivated middle socioeconomic groups more so than those of higher or lower SEP.

5.2 RESEARCH STRENGTHS AND LIMITATIONS

5.2.1 STRENGTHS

This research is the first known study to purposively and comprehensively measure socioeconomic differences in response to mass media health promotion campaigns that address lifestyle related chronic disease. The study design is singularly more focused on the comprehensive assessment of socioeconomic differences in a representative population response, instead of adjusting for SEP as is done in many analyses of campaign outcomes, or using SEP to describe the characterises of the sample. This work builds on other studies and is characterised by increased methodological rigour called for in many systematic reviews that address evaluations of mass media health promotion campaigns.

5.2.1.1 Strengths of the method

The comprehensive assessment of SEP by education, occupation, and yearly household income minimised loss of usable respondent outcome data. These data may have otherwise been lost in cases where income information was omitted but the respondents provided usable education and/or occupation information. In the current study only 75 respondents were excluded from analysis because they gave no SEP information. In the remaining sample 124 respondents were missing data on income level, but SEP analysis was still able to be performed on the majority of these respondents because they had provided data on either or both, their education level (only 4 missing cases), or occupation (only 12 missing cases).

There are a number of other methodological factors that add strength to the study design. Random sampling of participants from the Australian electoral roll facilitated an across-population approach and improved the likelihood of capturing participants who may have otherwise been excluded because they did not have landline telephones.

Secondly, data collection by postal survey was most appropriate for the focus of this research because compared to telephone interviews, mail surveys tend to have the lowest incidence of income non-response (Turrell, 2000) and also have the potential to reach members of the population who only have a mobile phone or no phone at all. A large proportion of mobile phone only households are of lower SEP (Blumberg et al., 2006; Hu et al., 2010); thus, a survey by post reduces bias that may have occurred from this source.

Thirdly, the survey questionnaire was specifically developed for the study and was strengthened by the use of a theoretical base and model to guide domains of response for examination. The questionnaire was soundly based on published literature and chronic disease website information, and also met the needs of a study that looks at SEP in a mass media campaign. The questionnaire was piloted across socioeconomic groups. Readability was comparable with other surveys examining similar topics, and reliability was established using the test-retest method. Kappa coefficients for individual items in CDRFs of Cancer, Heart Disease and Overweight indicated a moderate or greater level of score reliability. In addition, in all time periods 4 of the 5 understanding indices attained between moderate and substantial reliability as determined by ICC. Kappa coefficients for campaign effects on behaviour change were also all between moderate and perfect. These results indicate considerable reliability in the survey. Score reliability in LRCD and Type 2 Diabetes were lower however, and these are discussed in the Limitations section (p. 271).

Fourthly, an acceptable response rate was attained using the Tailored Design Method to administer the survey. The response rate of 61.5% in this study surpasses postal questionnaire response rates in two UK studies, namely 58% (Miles et al., 2001) and 37.6% (Croker, Lucas, and Wardle, 2012).

Rigour was also promoted by a purposive analysis using SEP indicators as independent variables, thus giving strength to the design in contrast with many other studies that use SEP indicators as adjustment variables, or to describe the sample.

5.2.1.2 Strengths in determining reach

Few studies have used such a strong combination of determinants of campaign reach. Statistically significant outcomes of campaign awareness were aided by recognition in the survey questionnaire of a frequently featured campaign image, and further confirmation by respondent indication of exposure by media channel.

This study is one of few that examines campaign exposure by media channel and also by the total number of channels by which respondents were exposed. The more channels by which respondents are exposed, increases the perception that everyone is promoting the same idea and thus the idea is more credible (Hornik & Kelly, 2007).

5.2.1.3 Strengths in determining understanding

This study is the only known study to comprehensively evaluate socioeconomic differences in respondent understanding of the campaign message and language used in a mass media campaign. Few studies have evaluated understanding and the current study is made more pertinent by a recent report of a campaign evaluation in the UK (Croker et al., 2012). The authors reported that they removed from the postal questionnaire the component that would evaluate parents' knowledge of food and activity recommendations for children. The knowledge component, which was developed for the original proposal, was removed so as to minimise respondent burden and optimise recruitment.

The current study presents a very strong case for specifically addressing in real terms what overweight and obesity means to health, and that this information needs to reach and be understood by low socioeconomic groups who bear the highest prevalence of these conditions. In this study, understanding of campaign terminology is addressed at the primary disease prevention level, unlike most health literacy research, which examines health literacy in patients who already have a disease (Freedman et al., 2009).

5.2.1.4 Strengths in determining effectiveness

There is very little literature that reports SEP differences in behavioural outcomes of mass media campaigns that combat obesity. Thus, this study was among the first to examine socioeconomic differences in respondents' measurement of weight and waistline in response to prompting by a mass media campaign.

5.2.2 LIMITATIONS

5.2.2.1 Limitations of the method

5.2.2.1.1 *Limitations of using a postal survey when most other studies use phone surveys.*

The use of a postal survey data collection method has some disadvantages. One logistical drawback that was not anticipated was the lengthy, heavy rainy period in Brisbane at the time of the survey mail-out. Reach of the survey to potential respondents may have been impaired by loss of destroyed surveys. One respondent wrote a note apologising for the condition of the survey, saying "Sorry for the condition of this, it was very wet from rain when retrieved from the letter box. Tried to dry it as best I could!" Many recipients would have simply discarded the survey as unusable. Despite this unavoidable problem, however, the response rate of 61.4% response rate was attained.

5.2.2.1.2 *Limited survey generalisability due to 38.6% non-response.*

The major limitation to this study arising from the 38.6% survey non-response rate is that lower socioeconomic groups may not have been fully reached, leading to a possibly considerable underestimation of the study outcomes. The response of this group was particularly sought after because of their poor record of survey response (Turrell et al., 2003), and they most likely comprise a large proportion of the non-responders in the sample.

It is likely that non-response was higher in respondents of lower SEP because this group has the highest prevalence of low literacy in the Australian population (ABS, 2006), compounded by the highest prevalence of low health literacy (ABS, 2006). These two factors are likely to be strong deterrents to completion of a survey that has to be read and understood, and uses health related language. In addition, there may have been other reasons why people did not respond, such as not having the knowledge to answer the questions, not wanting to actually write down how much exercise, how much fruit and vegetables, how much alcohol they consume, or how much they weigh. For some, these questions might have been too confronting and as a result this information was not obtained.

A recent study reporting a landline telephone evaluation of the *Measure Up* campaign as implemented in the state of New South Wales (King, Grunseit, O'Hara & Bauman, 2013) achieved proportional response rates of 28% for the pre-campaign sample collected prior to the campaign launch in October 2008, and 35% for the post-campaign sample completed during the second media flight in April 2009. The King study used random digit dialling of landline phones, known to yield proportionally higher response rates from higher socioeconomic groups (Donovan et al. 1997; Wang, et al. 2009). Descriptive characteristics of the responding sample by SEP were not reported. In addition, the sample was weighted against ABS 2006 Census data by only age, gender, and location (capital or non-capital city), not SEP. The present study, however, attained response rates of over 60%, thus meeting recommendations for generalisability (Price et al., 2004). In addition, the characteristics of respondents in terms of age, gender, education and occupation, were comparable with ABS 2006 Census data for the geographic area.

5.2.2.1.3 *Limited researcher control in manner of survey completion.*

The mail-survey method renders the researcher with no control over whom the survey is completed by or the order in which the respondent completes the questions. As well, any advantage that can be gained from the ordering of questions might be negated when a respondent looks through the whole questionnaire and perhaps adjusts their responses by way of the information gained (Bowling, 2005). In the survey for this study, the ideal order of completion was from front to back in a sequential order. The wording of some questions may have prompted answers to previous questions.

In addition, use of the mail survey excludes the option of determining 'unprompted recall', of both the campaign, and knowledge. 'Prompted recall' as used in this study is a relatively lenient measure of knowledge compared to an open ended question

(Weinstein, 1999). Further prompting in the wording of questions may cue respondents towards a particular answer (Cameron, Scully, Herd, Jamsen, Hill & Wakefield, 2010) or to select an option that they perceive is more socially desirable. Such prompting also may have served to assist the respondent in provision of a correct answer when they may have otherwise, without the unintentional prompting, provided an incorrect answer. This tendency leads the current study to understate rather than overstate levels of incorrect knowledge.

5.2.2.1.4 *Potential response bias due to literacy and health literacy capacity of potential respondents.*

Another limitation of the postal survey method in this research is the conflict between the data collection method and the literacy and health literacy capacities of many potential respondents. The study aimed ideally to have approximately equal thirds of respondents in each of high, middle, and lower socioeconomic groups, but it is known that literacy and health literacy skills are lower in persons of low SEP (ABS, 2006). Paradoxically, this study not only asked respondents to read questions that used health related language, but it also asked them to identify correct answers from even more health oriented text.

Completion of the survey clearly required a level of literacy and health literacy adequate to understand and answer the questions. This required level of accuracy, however, was no greater than that needed to understand the language and health terminology used in *Measure Up* campaign advertisements, literature, and online information. In addition, other information used in the chronic disease related questions was obtained from websites of organisations whose purpose it is to provide information to the public about the relevant chronic disease. The websites from which information was obtained included *The National Heart Foundation, Diabetes Australia*, and *The Cancer Council*. The health information obtained from these websites was no more complex than that used in the *Measure Up* campaign. Hence, persons who could not read or understand the survey were unlikely to have understood the campaign advertisements and information and also were probably less likely to complete the survey. Consequent associations between SEP and knowledge and understanding identified by this research were more likely to be underestimated and understated than overestimated and overstated. Pilot testing and readability estimates confirmed my confidence in respondents schooled to the age 15 being able to read the questionnaire. Not being comfortably able to read the questionnaire may have influenced potential respondents not to complete the survey; hence, the true understanding of campaign terminology may go understated through non-response.

5.2.2.2 Limitations of the questionnaire

5.2.2.2.1 *Limitations due to lower readability and reliability in knowledge items regarding 'Lifestyle Related Chronic Disease', 'Type 2 Diabetes', and 'Cancer'.*

Although LRCD and Type 2 Diabetes had a relatively higher SMOG scores (10.9 and 10.1 respectively), the individual item coefficients for LRCD items when measured against the Landis and Koch sale (1977) showed 'Fair' reliability and when measured within 63 days of the pre-test but improved to 'Moderate' when measured 64-117 days after the pre-test. For Type 2 diabetes there was not such paralleling. Type 2 diabetes item scores measured within 63 days of the pre-test showed 'Substantial' reliability and this strength on the Landis and Koch scale was maintained when items were measured at 64-117 days. Reliability of the Cancer items measured within 63 days was 'Moderate' but lessened to 'Slight' for items measured at 64-117 days.

5.2.2.2.2 *Limitations on findings in effectiveness through not accounting for existing baseline behaviours*

Determination of change in behaviour is better accounted for in a pretest-posttest design. This study did not have this opportunity as three 'flights' of the campaign had already been implemented in previous years. To offset this less than optimal design to determine effectiveness in behavioural change, the question about being prompted by the campaign to engage in stated early behaviours should have included an additional option for respondents to tick that they were already engaged in the behaviour (and thus the *Measure Up* campaign did not prompt them). This omission could have possibly had a major influence on the lack of significant difference between lower and higher socioeconomic groups in the results concerning effectiveness. Higher socioeconomic groups, more of whom it was expected would have been already engaged in health behaviours, may not have indicated that *Measure Up* had prompted them because they already were engaging in the behaviour.

Alternatively, it may be that people in middle socioeconomic levels were more responsive to this campaign as a result of unintentional targeting of this group by the campaign developers. Persons of lower SEP may have been less likely to respond because the campaign messages did not attract them. Higher socioeconomic respondents may have been saturated from decades of exposure to campaigns for which they are adequately educationally prepared and thus were not prompted. In either case, the question of being prompted to do specific behaviours as a result of the campaign was identified as deficient after study completion, and thus the effectiveness results should be viewed with caution.

5.2.2.2.3 *Limitations due to removal of the Not Easily Classified (NEC) occupational category*

This category comprised 139 respondents but had to be removed because of the group heterogeneity (group characteristics were too diverse). This step left blue-collar workers to be the only lower socioeconomic category, and as such, detection of differences between groups in occupational terms was harder to achieve. Use of a similar item in future studies should elicit more specific information about respondents' previous occupations to assist categorisation and minimise loss from the analysis sample of those not engaged in paid employment.

5.2.2.3 Limitations of ascertaining socioeconomic differences in reach

5.2.2.3.1 *Omission of analysis on the relationship between media channel exposure and understanding and effectiveness*

The media channel exposure index (MCEI) could have been analysed for effect of multiple exposures on understanding and effectiveness. Multiple exposures can increase understanding by an incremental increase in knowledge with each exposure or different type of exposure. Also in this way, multiple exposure might facilitate the idea of Natharius (2004) that 'the more we know, the more we see', thus having a cumulative effect. The study did not pursue this line of analysis after finding that the only significant relationship was between respondents with low-middle income being exposed to fewer media channels.

5.2.2.4 Limitations of ascertaining socioeconomic differences in understanding

Not having asked for respondents' understanding of the tag line/message *"Are you on your way to chronic disease?"* was a limitation of the survey method. However, if this question had been asked as an open ended question on a written survey, it may have further biased respondents with poor writing literacy and health literacy skills. Composing a written response may have been challenging for some because of the abstract nature of the tagline. It requires respondents to know the meaning of the term 'chronic disease' as well as knowledge of the relationships between waist measurement and chronic disease. The questions in the current study sought to ascertain whether respondents had this baseline knowledge so as to interpret the campaign tagline. This item could have been addressed by asking respondents to choose from a number of options as to the meaning, but would be better addressed within a qualitative study.

5.2.2.5 Limitations of ascertaining socioeconomic differences in effectiveness

One item, found to be inadequate in response options, was removed from analysis. This item (survey number 2.2) was predominantly concerned with whether *Measure Up* campaign short term objectives were met. Respondents were asked whether the *Measure Up* campaign had made them aware, helped them recognise, encouraged them to pursue, made them feel confident, made them wonder, or made them think, about various factors related to the prevention of lifestyle related chronic disease. A third response option column should have been provided for respondents to record that they 'already knew' or 'already were' doing these. Many respondents wrote such comments on their survey alerting me to the problem during data entry.

The short term campaign objectives, which included increasing awareness, raising appreciation, generating more positive attitudes, and generating confidence, were difficult to measure without a pre-campaign data set from which to measure self-reported change. The survey item developed to measure respondents' self-reports of change resulting from exposure to *Measure Up* advertisements was found to be inadequate and thus excluded from analysis. The study would have benefitted from more time spent in the pilot testing stage on how the questions were answered.

5.2.2.5.1 Limitations due to the absence of a baseline measure.

The Absence of a baseline measure from which to measure proximal behaviours renders less confidence in the effectiveness results. This limitation was unavoidable however, because of the timing of the survey in the middle of an already running campaign; it was not possible to collect information about baseline or pre-campaign behaviours.

5.2.2.6 Limitations of minimal process evaluation of the Measure Up Campaign

Because the *Measure Up* campaign was well under way when the research for the current thesis was conducted, there was limited opportunity to evaluate development of the campaign. Requests to the Department of Health and Ageing for information about the campaign were most often not replied to. Information about focus group evaluation in the development of the *Measure Up* campaign is discussed in the section entitled 'Socioeconomic level input in formative stages of message development' (please see last paragraph, p. 45).

5.3 DIRECTIONS FOR FUTURE RESEARCH

Future research would be enhanced by a qualitative study into the health information needs of persons across all socioeconomic levels; what people want to know and how do they want to receive that information. Mass media campaigns such as *Measure Up* are appropriate mediums around which to centre the research because of the potential to facilitate broadly scoped discussion.

Research is needed that focuses on how best to access lower socioeconomic groups in terms of both campaign reach and channels of exposure, as well as to identify language, messages and images that appeal to or attract lower socioeconomic groups. Work is also needed to investigate information networking in lower socioeconomic groups in view of perhaps using these networks to convey appropriate information.

Also of considerable interest and value would be the analysis of socioeconomic differences in relationships between family history of chronic disease or respondent's own medical history, and reach, understanding, and effectiveness, so as to test the ideas of Ettema et al. (1983) that such personal relevance may be associated with understanding, and effectiveness. Data for this task have been collected in the current study. This information might have relevance for more targeted campaign content for those with risk factors including family history.

Finally, future research should be directed at the development of a standardised evaluation framework that is rigorous and has the flexibility to adapt to different styles of mass media campaigns, whilst still producing outcomes that enable quality and effectiveness to be compared.

5.4 IMPLICATIONS OF THE RESEARCH, AND RECOMMENDATIONS

The current research provides strong evidence that compared to respondents in higher socioeconomic groups, respondents in lower socioeconomic groups responded significantly less to a mass media health promotion campaign in terms of campaign reach and their understanding of the message.

Implication: Campaigns still may not be reaching those most in need.

The campaign was effective in prompting middle level socioeconomic groups to measure their waist, but not higher or lower socioeconomic groups. It is postulated that this may be related to a lack of appeal or framing of the message to low and high socioeconomic groups.

Recommendation: Our approach to the design and testing of mass media health *promotion campaigns needs to change.* Campaigns should be conceived, designed, and developed within a total population framework that is formatively evaluated in socioeconomic terms from its beginning to evaluation of outcomes.

Implication: Stand-alone campaigns may not be enough:

It should be emphasised that this study was conducted using the medium of a ‘stand-alone’ mass media campaign, and as such, respondents did not have the advantage of support networks or resources except for online information that was self-reported to have been accessed by very few people. Results may have differed if the campaign was bolstered by community and organisational supports.

Recommendation: Campaigns need the support of visible community programs that confirm the reality, accessibility, and achievability of the healthy lifestyle recommendations being promoted. These support resources should be an obvious functioning part of the campaign and be able to attract persons of all SEPs and promote lifestyle behaviours attainable and achievable by all socioeconomic groups.

Implication: Target audience baseline knowledge may not be adequate to build an understanding.

Awareness, understanding, and effectiveness can all be traced back to lack of knowledge. Inadequate knowledge can impair awareness that something is important or relevant and therefore should be taken notice of or acted upon. Inadequate baseline knowledge can impair the acquisition of new knowledge by which to build and develop an understanding and ability to make informed decisions and health lifestyle choices to prevent chronic disease. This study illustrated relationships between low understanding and low engagement in healthy behaviours. For example, those with low Understanding Index scores for overweight and obesity were least likely to weigh themselves; those with low Understanding Index scores for Type 2 Diabetes were least likely to increase their fruit and vegetable intake; and those with low Understanding Index scores for Cancer, Lifestyle Related Chronic Disease, and Type 2 Diabetes were least likely to be prompted to measure their waist.

Recommendation: Television has been shown to reach widely across all population groups and thus should be better utilised to explain information at a level that can be understood, and applied by all. The scientific information that is reported on well researched and scientifically based programs such as *Catalyst* or the *Health Report* on Radio National may be able to be heard by all who have a television or a radio, but it is unlikely to be fully understood. Government funded community television and radio programs could help meet this information access deficit. Using these mediums can facilitate people learning in the privacy of their own home and using the medium they most use.

Governments at all levels -national, state and local -have an important role to play, both upstream by providing an education system that provides the knowledge base on which health knowledge can be built, and at midstream levels in disseminating educationally sound public health information in a manner that does not single out those with less knowledge as being different, and in a manner and format that will appeal, can be accessed, understood and acted on by all.

5.5 CONCLUSION

This is the first known study to specifically examine socioeconomic differences in reach and effectiveness of a mass media health promotion campaign to prevent lifestyle related chronic disease. It is also the first study to comprehensively examine socioeconomic differences in respondents' understanding of the health language used in the campaign message and information.

A model was developed to guide exploration of claims that mass media health promotion campaigns contribute to a widening of the gap in health inequality. Differences in socioeconomic response were explored in terms of campaign reach, respondent understanding of the campaign language and health message, and response to campaign prompting of proximal behaviours.

Findings revealed significantly lower campaign reach for lower socioeconomic groups in terms of campaign awareness and multiple media channel exposure. Respondent understanding of campaign language and messages in terms of knowledge about the chronic disease or risk factor, health effects, and preventive lifestyle strategies, was lowest for lower socioeconomic groups than for higher. Given that awareness and knowledge/understanding will affect behaviour, gaps will increase if that which causes them is not rectified. Hence, this research supports the claim that mass media health promotion campaigns contribute to the widening gap in health inequality.

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[1] When there has been more than one reference by the same author in the same year, ‘a’ or ‘b’ or ‘c’ has been allocated according to chronological occurrence in the text not by alphabetical order of the title.

Appendices

Appendix A:

Study Questionnaire

How's your health?

Queensland University of Technology

How's your health?

A survey about
YOU, your
LIFESTILE
and
a HEALTH
CAMPAIGN,
for
men and women
aged
45-60 years

ihbi
Institute of Health and Biomedical Innovation

How's your health?

This study is in three parts. First we ask about your lifestyle and your thoughts about health. Next we are very interested in your response to a recent health campaign called "Measure Up", and finally, we ask about you and your household.

Your answers are very important to us and we greatly appreciate your help in completing this survey.

Please remember:

- Your answers will be treated as strictly **PRIVATE** and **CONFIDENTIAL**
- Please follow the instructions for each question. We have provided an option for you to tick if you do not know the answer.
- Please give one answer only for each question, unless otherwise stated.
- Please tick the boxes when answering each question or write in the space provided where indicated.

If you have any questions please call **Robin Armstrong on (07) 3138 8291** or e-mail: robin.armstrong@qut.edu.au

When you have completed the survey please return the survey to us **as soon as you can in the reply paid envelope**

(No stamp needed).

Section 1: Your health

1.1 In general, would you say that your health is:

☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

1.2 Has a doctor ever told you that you currently have or have had in the past, any of the following conditions?

(Please tick one box for each question)

Heart conditions (coronary heart disease, chest pain, heart attack)	☐	☐	☐
High blood pressure or hypertension	☐	☐	☐
High cholesterol	☐	☐	☐
Stroke or mini stroke	☐	☐	☐
Diabetes or high blood sugar	☐	☐	☐
Any type of cancer (except skin cancer)	☐	☐	☐

1.3 How many serves of fruit do you usually eat each day?
(Some examples of 1 serving are: 1 medium apple or banana, OR 2 apricots, OR ½ cup of tinned fruit, OR 1 cup of fresh fruit, berries, grapes OR $^1/_3$ cup of dried fruit OR ½ cup juice)

(Consider all types – fresh, frozen, dried, tinned or juice)
(Please tick one box only)

☐ I don't eat fruit ☐ 1 serve or less per day ☐ 2-3 serves per day ☐ 4-5 serves per day ☐ 6 serves or more per day

1.4 How many serves of vegetables do you usually eat each day?
(Some examples of 1 serving are: ½ cup cooked vegetables OR ½ cup cooked dried beans, peas or lentils OR 1 cup fresh/salad vegetables)

(Consider all types – fresh, frozen, dried, tinned)
(Please tick one box only)

☐ I don't eat vegetables ☐ 1 serve or less per day ☐ 2-3 serves per day ☐ 4-5 serves per day ☐ 6 serves or more per day

1.5 How many slices of MULTIGRAIN, WHOLEMEAL or HIGH FIBRE bread do you usually eat each day?

(Please tick one box only)

☐ 0-1 slices ☐ 2-3 slices ☐ 4-5 slices ☐ 6 or more slices ☐ I don't eat these types of bread

(Please tick one box only)

☐ Yes ☐ No, I have never smoked ☐ No, but I used to smoke regularly ☐ No, but I used to smoke occasionally

1.6 Do you smoke tobacco at the present time (cigarettes, cigars, pipe)?

(Please tick one box only)

☐ Yes ☐ No, I have never smoked ☐ No, but I used to smoke regularly ☐ No, but I used to smoke occasionally

1.7 How often do you have a drink containing alcohol?

(Please tick one box only)

☐ Never ☐ Monthly or less ☐ 2 to 4 times a month ☐ 2 to 3 times a week ☐ 4 or more times a week

1.8 How many standard drinks containing alcohol do you have on a typical day when you are drinking? (Some examples are: 1 Stubbie/can of mid-strength beer = 1 standard drink, 100 mls of wine = 1 standard drink, 30 mls (1 nip) of spirits = 1 standard drink)

(Please tick one box only)

☐ None, I don't drink ☐ 1 or 2 standard drinks ☐ 3 or 4 standard drinks ☐ 5 or 6 standard drinks ☐ 7 to 9 standard drinks ☐ 10 or more standard drinks

1.9 How many days per week do you usually do leisure time physical activity for at least 30 minutes?'

(Please tick one box only)

☐ None ☐ 1 day ☐ 2-3 days ☐ 4-5 days ☐ 6-7 days

1.10 Has your father or mother ever been diagnosed with any of the following ?

(Please tick one box for each condition)

	Yes	No	Don't Know
Heart attack	☐	☐	☐
Stroke	☐	☐	☐
Diabetes	☐	☐	☐
Any type of cancer except skin cancer	☐	☐	☐

1. 11 Do you agree or disagree with the following statements about lifestyle related chronic disease?

(Please tick one box for each statement)

--	Agree	Disagree	Don't
Lifestyle related chronic diseases can last more than 6 months and can keep coming back	☐	☐	☐
Lifestyle related chronic diseases only occur in the elderly	☐	☐	☐
Lifestyle related chronic diseases can be quickly cured with medication	☐	☐	☐
Lifestyle related chronic diseases can be prevented by regular physical activity	☐	☐	☐
Lifestyle related chronic disease is too late to do anything about	☐	☐	☐
Lifestyle related chronic diseases can result in pain, disability or early death	☐	☐	☐

1.12 Do you agree or disagree with the following statements about YOUR risk of chronic disease?

(Please tick one box for each statement)

	Agree	Disagree	Don't Know
My risk of lifestyle related chronic disease would be <u>increased</u> if my waistline measurement was greater than 94 cm (males) or 80 cm (females).	☐	☐	☐
My risk of lifestyle related chronic disease would be <u>decreased</u> if I was physically active for more than 30 minutes each day.	☐	☐	☐
My risk of lifestyle related chronic disease would be <u>increased</u> if I regularly ate less than 2 serves of fruit and 5 serves of vegetables each day.	☐	☐	☐
My risk of lifestyle related chronic disease would be <u>decreased</u> if I drank mainly water throughout the day.	☐	☐	☐

1.13 Do you consider yourself :

(Please tick one box only)

Underweight	☐
Normal weight	☐
Overweight	☐
Obese	☐

1.14 Do you agree or disagree with the following statements about Type 2 diabetes?

(Please tick one box for each statement)	**Agree**	**Disagree**	**Don't Know**
People who have excess weight around their waist line are at higher risk for Type 2 diabetes.	☐	☐	☐
Type 2 diabetes is a condition that causes there to be too much sugar in the blood.	☐	☐	☐
Type 2 diabetes is a condition in which the body does not produce enough insulin or the insulin does not work properly.	☐	☐	☐
Type 2 diabetes is a condition that is easily treated by simply not eating sugar.	☐	☐	☐
Type 2 diabetes is a condition that only affects elderly people.	☐	☐	☐
Type 2 diabetes is a condition that is preventable by keeping a healthy weight, taking daily physical activity and making good food choices.	☐	☐	☐
Type 2 diabetes is a condition in which glucose cannot get from the bloodstream into the body cells.	☐	☐	☐

IF A PERSON HAS DIABETES THEY ARE MUCH MORE LIKELY TO EXPERIENCE OTHER SERIOUS HEALTH PROBLEMS SUCH AS:	**Agree**	**Disagree**	**Don't Know**
Heart attack	☐	☐	☐
Skin cancer	☐	☐	☐
Blindness	☐	☐	☐
Stroke	☐	☐	☐
Shingles	☐	☐	☐
Kidney damage	☐	☐	☐
Loss of a limb (from gangrene)	☐	☐	☐
Impotence	☐	☐	☐

1.15 Do you agree or disagree with the following statements about heart disease?

(Please tick one box for each statement)

	Agree	Disagree	Don't Know
Heart disease is also known as coronary heart disease			
Heart disease is a condition in which the blood vessels to the lungs become blocked making it hard to breathe.			
Heart disease develops over time with gradual blocking of one or more blood vessels that feed the heart muscle.			
Heart disease may first show as heart pain or angina.			

	Agree	Disagree	Don't Know
Heart attack is a severe form of heart disease in which part of the heart muscle dies.			
Heart attack can be cured by medications that thin the blood.			
Heart attack can lead to long term disability or death.			
Heart attack is preventable by being physically active each day, making healthy food choices, and keeping body weight down.			
I would consider myself at risk for heart disease if one of my parents were to die of heart attack.			

1.16 Do you agree or disagree with the following statements about cancer?

(Please tick one box for each statement)

	Agree	Disagree	Don't Know
Cancer is an illness that can occur at any age.			
Cancer is an illness in which abnormal cells multiply and are able to invade other cells.			
Cancer is an illness that always forms a lump so you know when you have it.			
Cancer is an illness in which some cases can be prevented by keeping a healthy weight, being physically active, and eating a healthy diet.			
Cancer is an illness that is a major cause of death in the Australian population.			

1.17 Do you agree or disagree with the following statements about bodyweight?

(Please tick one box for each statement)

BEING OVERWEIGHT INCREASES RISK OF:	Agree	Disagree	Don't Know
Skin cancer	☐	☐	☐
Breast cancer (post menopause)	☐	☐	☐
Prostate cancer	☐	☐	☐
Leukaemia	☐	☐	☐
Bowel cancer	☐	☐	☐

	Agree	Disagree	Don't know
If you have a large waistline this may mean that you have too much fat inside your abdomen.	☐	☐	☐
If you have a large waistline this may mean that fat coats your heart, kidneys, liver and pancreas increasing your risk of serious illness.	☐	☐	☐
If you have a large waistline this may mean that you should eat less snack and takeaway foods.	☐	☐	☐
If you have a large waistline this may mean that you should eat more vegetables, fruit and lean meat.	☐	☐	☐
If you have a large waistline this may mean that you should be moderately active for at least 30 minutes each day.	☐	☐	☐
If you have a large waistline this may mean that over time, you have taken in, more energy than you have burnt off leading to an energy imbalance.	☐	☐	☐

Section 2: The Measure Up campaign

2.1 Have you seen or heard any ads from the Measure Up campaign?
These ads would be similar to the picture below.

YES ☐ → Please go to **Question 2.2** on **page 9**

NO ☐ → Please go to **Section 3** on **page 12**

Are you on your way to chronic disease?

1 in 2 Australian adults is overweight. Most men with waistlines over 94 cm have an increased risk of some cancers, heart disease and type 2 diabetes. To find out more, go to Australia.gov.au/MeasureUp

How do you measure up

Australian Better Health Initiative
A joint Australian, State and Territory government initiative.

Used by permission of the Australian Government

2.2 Do you agree or disagree with the following statements about the Measure Up campaign?

(For each statement, please tick the box that best applies to you)

THE MEASURE UP CAMPAIGN ADS:	Agree	Disagree
Made me aware that there is a link between lifestyle and chronic disease	☐	☐
Made me aware that chronic disease can be prevented	☐	☐
Helped me to recognise the names of some chronic diseases	☐	☐
Made me aware that lifestyle change should be an urgent priority	☐	☐
Made me aware of healthy waistline measurements	☐	☐
Encouraged me to pursue recommendations for healthy eating, physical activity and healthy weight	☐	☐
Made me feel confident that I can make changes that will or minimise my risk of chronic disease.	☐	☐
Made me wonder whether I might be at risk for chronic disease	☐	☐
Made me think about whether my fruit and vegetable intake is sufficient to prevent chronic disease	☐	☐
Made me wonder whether I am physically active enough to prevent chronic disease	☐	☐
Made me wonder whether my waistline was within the recommended range	☐	☐
Made me think that I should check my weight	☐	☐

2.3 Where did you see or hear the Measure Up campaign ads?

(Please tick either yes or no for each statement)

	Yes	No
On TV	☐	☐
On radio	☐	☐
At a bus shelter	☐	☐
On a poster in a shopping centre	☐	☐
In a newspaper or magazine	☐	☐
On a shopping trolley	☐	☐
I can't remember where, but I have seen it	☐	☐

2.4 The Measure Up campaign ads have prompted me to:

(Please tick either yes or no for each statement)

	Yes	No
Measure my waistline	☐	☐
Weigh myself	☐	☐
Increase my physical activity	☐	☐
Increase my fruit and vegetable consumption	☐	☐
Talk to my doctor about preventing chronic disease	☐	☐

2.5 Did the *Measure Up* campaign ads prompt you to go online to the *Measure Up website?*

(Please tick one box only

NO, I don't have access to a computer	☐ →	Please go to Section 3 page 12
NO, I have access to a computer but did not go online	☐ →	
YES, I went on line to the Measure Up website	☐ →	Please continue to Question 2.6 below

2.6 I went online to the Measure Up website to:

(Please tick either yes or no for each statement)

	Yes	No
Find more information about what chronic disease is	☐	☐
Find information about healthy eating and healthy recipes	☐	☐
Send away for the tape measure and information kit	☐	☐
Find information about becoming more physically active	☐	☐
Find information about losing weight	☐	☐
Find more information about preventing chronic disease	☐	☐

Section 3: You and your household

This last section asks a few questions about you and your household. We need to ask these questions as it is important for us to make sure we have a wide variety of people in our study.

3.1 Please tick whether you are male or female.

Male ☐ Female ☐

3.2 In which year were you born?

1 9 _ _

3.3 Is English your first language?

Yes ☐ No ☐

3.4 How much do you weigh without your clothes or shoes on?

(If you have scales, please use them to check your weight)

Kilograms ☐ **OR** Stones ☐ & Pounds ☐ Don't know ☐

3.5 What is your waistline measurement?

Centimetres ☐ **OR** Inches ☐ Don't know ☐

3.6 How tall are you without shoes on?

(If you drive, you can find your height written on the front of your licence)

Centimetres ☐ **OR** Feet ☐ & Inches ☐ Don't know ☐

3.7 Is TV and other media the best way to provide health information to YOU?

(Please tick either yes or no and explain)

Yes ☐ Please explain why in the space below

No ☐ What method would you prefer? Please explain below.

3.8 What is the highest educational qualification that you have COMPLETED?

(Please tick one box only)

- ☐ Year 9 or less
- ☐ Year 10 (Junior/4th form)
- ☐ Year 11 (Senior/ 5th form)
- ☐ Year 12 (Senior/ 6th form)
- ☐ Certificate (trade or business)
- ☐ Diploma or Associate degree
- ☐ Bachelor Degree (Pass or Honours)
- ☐ Graduate Diploma or Graduate Certificate
- ☐ Postgraduate degree (Masters or Doctorate)
- ☐ Other *(Please describe)* ________________

____

____

3.9 Which ONE of the following best describes your current employment situation?

(Please tick one box only)

- Full time paid work in a job, business or profession. ☐ →
- Part time paid work in a job, business or profession. ☐ →
- Casual paid work in a job, business or profession. ☐ →
- Work without pay in a family or other business. ☐ →

PLEASE GO TO QUESTION 3.10 ON PAGE 14

- Home duties not looking for work. ☐ →
- Unemployed looking for work. ☐ →
- Retired. ☐ →
- Permanently unable to work. ☐ →
- Studying. ☐ →
- Other *(please specify)* ☐ →

[ ]

PLEASE GO TO QUESTION 3.11 ON PAGE 14

3.10 What is your current occupation? (If you have more than one job, please indicate your main job.)

Please give full title (some examples are: Childcare aide, Mathematics teacher, Pastry cook, Builder's labourer, Commercial airline pilot, gas fitter). For ***Public servants****, please state official designation and occupation. For* ***Armed Services personnel****, please state rank and occupation.*

Full title of occupation:

3.11 In this last question, we would be grateful if you could provide us with an estimate of your total household income.

People may feel uncomfortable providing information about their income and so to make this easier, we have grouped incomes into categories so that your actual income cannot be identified.

By answering this question you will help us ensure that all Brisbane residents are represented in the outcomes of this study thus informing strategies for equal access to health information.

WHAT IS THE TOTAL INCOME OF YOUR HOUSEHOLD BEFORE TAX?
(i.e. the income of all people in the house combined)

Per Year	OR Per Fortnight	OR Per Week
☐ Less than $15,599	☐ Less than $600	☐ Less than $300
☐ $15,600 - $20,799	☐ $600 - $799	☐ $300 - $399
☐ $20,800 - $25,999	☐ $800 - $999	☐ $400 - $499
☐ $26,000 - $31,199	☐ $1000 - $1,199	☐ $500 - $599
☐ $31,200 - $36,399	☐ $1,200 - $1,399	☐ $600 - $699
☐ $36,400 - $41,599	☐ $1,400 - $1,599	☐ $700 - $799
☐ $41,600 - $51,999	☐ $1,600 - $1,999	☐ $800 - $999
☐ $52,000 - $72,799	☐ $2,000 - $2,799	☐ $1,000 - $1,399
☐ $72,800 - $93,599	☐ $2,800 - $3,599	☐ $1,400 - $1,799
☐ $93,600 - $129,999	☐ $3,600 - $4,999	☐ $1,800 - $2,499
☐ More than $130,000	☐ $5,000 or more	☐ $2,500 or more
☐ Don't know		
☐ Don't wish to answer		

Finally…

We are planning a brief follow up of this study which may be carried out by phone or face-to-face interview. Our aim is to gain further information about why people do or don't respond to health promotion campaigns. <u>We would greatly value your input in to this study.</u>

If you would be happy for us to contact you again for this purpose please complete your details below. Your personal details will not be used for any other purpose or be given to any third party.

Name:

Street address:

Suburb:

Postcode:

Home Telephone:

Email address:

Mobile phone:

THANK YOU

We would like to thank you for the time and effort you have put in to completing this survey. The information you have provided is valuable to us and will be treated with the strictest confidence.

Please return this survey in the enclosed reply paid envelope (no stamps necessary).

Appendix B:

Questionnaire Item Content Map

Appendix B: Questionnaire Item Content Map

Research Question	Item in Survey	Source	Notes
What is the relationship between SEP and EFFECTIVENESS of the Measure Up campaign messages in terms of proximal behaviour response. (Awareness of current state of health as a focus from which to judge the need or not to respond or change behaviour).	*1.1 In general would you say **your health** is:*	HABITAT study (Burton et al., 2009; Heistaro et al., 2007). Similar item (Q29) in Greater Green Triangle Risk Factor Study (Heistaro et al., 2007).	Participants' assessment /perception of own health
	*1.2 Has a doctor ever told you that you have or had any of the following **conditions?***	Qld Cancer Risk study,p29 {Qld Cancer Fund, 2005} Similar item in HABITAT, p15 (Burton et al., 2009) Similar item (Q 31) in the Greater Green Triangle Risk Factor Project (Heistaro et al., 2007)	Chronic disease status Risk factor status (HT, cholesterol, BSL)
	*1.3 How many serves of **fruit** do you usually eat each day?*	National Nutrition Survey p.100 Q5 (McLennan & Podger, 1998).	Risk status: fruit consumption
	*1.4 How many serves of **vegetables** (excluding potatoes) do you usually eat each?*	As above p99 Q4 (McLennan & Podger, 1998).	Risk status: vegetable consumption
	1.5 How many slices of multigrain, wholemeal or Hi Fibre bread do you usually eat each day?	Similar to Q78 as above (Heistaro et al., 2007).	Risk status: dietary fibre
	*1.6 Do **you smoke tobacco** at the present time (cigarettes, cigars, pipe)?*	Q 55 as above (Heistaro et al., 2007).	Risk status: smoking
	*1.7 **How often** do you have a drink containing alcohol?*	Item from: Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption—II (Saunders et al.,1993).	Risk status: alcohol consumption
	*1.8 **How many drinks containing alcohol** do you have on a typical day when you are drinking?*	Saunders et al. (1993). As above	Risk status: alcohol consumption
	*1.9 How many days per week do you usually **exercise for at least 30-minutes?***	Study questionnaire from MobileMums: a randomized controlled trial of a physical activity intervention delivered via SMS (Fjeldsoe et al., 2010).	Risk status: physical activity, revised post pilot study to: 'How many days per week do you do

			leisure time physical activity for at least 30 minutes?'
	*1.10 Has **your father or your mother** ever been diagnosed with any of the following conditions?*	- Q 48/49 as above (Heistaro et al. 2006)	Risk status: immediate family history
What is the relationship between SEP and UNDERSTANDING of the Measure Up campaign message and language?	*1.11 **Lifestyle related chronic diseases:***	Developed from information on the *Measure Up* website: Glossary, FAQs, Link between chronic disease and lifestyle (Australian Better Health Initiative, 2006b).	Understanding the concept – the nature of chronic diseases. What is a chronic disease prevention (Smith et al., 1999)
	*1.12 Do you agree or disagree with the following statements about **your risk for chronic disease?***	As above :Health Risks, Physical Activity guidelines for adults, Dietary guidelines.(Australian Better Health Initiative, 2006b)	Understand that their behaviours will affect their risk (to prevent or delay the onset of chronic disease)
What is the relationship between SEP and EFFECTIVENESS (as above). (awareness of <u>own risk factor</u> status as a focus from which to judge the need or not to respond or change behaviour)	*1.13 Do you consider yourself underweight, normal weight, overweight, obese?*	National Health Survey (ABS, 2009b)	Perception of own weight – understanding own health
What is the relationship between SEP and UNDERSTANDING (as above).	*1.14 Do you agree or disagree with the following statements about **Type 2 diabetes?*** *1.14 (cont'd) If a person has **diabetes** they are much more likely to experience other health problems such as…*	Developed from information on the *MeasureUp* website 'Chronic disease and its impact on Australia' fact sheet. ABHI Glossary, ABHI FAQs. (Australian Better Health Initiative, 2006b). 'Talking diabetes' fact sheet No. 42: What is diabetes? (Diabetes Australia- Queensland, 2008). No. 22: Heart disease & diabetes(Diabetes Australia-Queensland, 2008). No 31: Sexual Health & diabetes (Diabetes Australia- Queensland, 2008).	Understanding health related language . What diabetes is. How to prevent it. Understanding health related language . Diabetes - What are the health effects?
	*1.15 Do you agree or disagree with the following statements about **heart disease?***	Developed from information on the *MeasureUp* website –Glossary (Australian Better Health Initiative, 2006b), and Coronary Heart Disease (Heart Foundation, 2010). Heart Attack Facts {Heart Foundation,	Understanding health related language . What heart disease or heart attack is.

		2010). Heart Attack Treatment (Heart Foundation, 2010). Heart Statistics (Heart Foundation, 2010).Risk Factors (Heart Foundation, 2010).	How to prevent. What are the health effects?
	1.16 Do you agree with the following statements about ***cancer?***	Developed from information on the *MeasureUp* website – 'Chronic disease and its impact on Australia' fact sheet. (Australian Better Health Initiative, 2006b). 'FAQs' & 'Smart Lifestyle' fact sheets (Cancer Council Australia, 2010a, 2010b)	Understanding what cancer is, lifestyle related, prevent ion, major cause of death,
	1.17 do you agree with the following statements about body weight?	National Cancer Prevention Policy (Cancer Council Australia 2007-2009) 'The link between chronic disease and lifestyle'(Australian Better Health Initiative, 2008c). 'Health risks' (Australian Better Health Initiative, 2008a).' Helpful tips' (Australian Better Health Initiative, 2008b).' What should I be eating?' (Australian Better Health Initiative, 2008e) 'Physical activity guidelines for adults' (Australian Better Health Initiative, 2008d)	relationship of body weight to certain cancers, significance o large waistline, what to do
What is the relationship between SEP and REACH of the MeasureUp campaign	*2.1 Have you seen or heard any ads from the Measure Up campaign?*	Similar image related item in 2001 National Tobacco Campaign evaluation research (Kinsman & Taylor, 2003).	Awareness / recall /recognition of photo of campaign male image.
What is the relationship between SEP and EFFECTIVENESS (as above).	*2.2 Do you agree or disagree with the following statements about the MeasureUp campaign.*	Developed from campaign objectives (Australian Better Health Initiative, 2006a).	Awareness and thinking about campaign message
What is the relationship between SEP and REACH(as above).	*2.3 Where did you see or hear the Measure Up campaign ads?*	Similar item as above (Kinsman & Taylor, 2003).	Further confirms that respondent saw the advert and helps recall.
What is the relationship between SEP and EFFECTIVENESS (as above).	*2.4 The Measure Up ads have prompted me to:* *2.5 Did the Measure Up ads prompt you to go online to the Measure Up website?*	Developed from *MeasureUp* fact sheets (Australian Better Health Initiative, 2006b).	Measures more definitive proximal behaviours related to campaign message. Measures effectiveness of advertisement prompting pursuit of more

			information.
	2.6 I went online to the Measure Up website to:	Developed from menu options on the website (Australian Better Health Initiative, 2006b).	Measures the type of info pursued.
Demographic items	*3.1 to 3.6 Standard items*	Weight & height from HABITAT (Burton et al., 2003) Waistline from *MeasureUp* (Australian Better Health Initiative, 2006b, Heistaro et al., 2007).	Measures BMI & risk English as 1st language affects understanding.
	3.7 Is TV and other media the best way to provide health info to you?	Qualitative and quantitative item developed by researcher.	Documents how people prefer to receive health information
SEP in all research questions	*3.8 What is the highest education level that you have completed?* *3.9 Which one of the current best describes your current employment situation?* *3.10 What is your current occupation?* *3.11 What is the total income of your household before tax?*	(Burton et al., 2003)	Contribute to socioeconomic position.

Appendix C:

Pilot Study Documents

Appendix C1: Pilot study recruitment flyer

How's  **your health?**

Would you like to earn $20?

We are looking for people aged between 45 and 60 to help us test out a questionnaire for a study that looks at health, lifestyle and a currently televised health campaign.

You will be asked to fill out the questionnaire at home and then within a day or so after, answer a few questions about:

- Questions or words that were hard to understand
- Which parts of the questionnaire were difficult to fill out
- How long it took

Talking about the questions should take less than an hour.

Please contact Robin on 3138 8291 or email robin.armstrong@qut.edu.au

if you are interested in participating or would like more information.

QUT ihbi Institute of Health and Biomedical Innovation

Appendix C2: Pilot study participant characteristics

Income Group	Income Range	Participant Age	Participant Occupation	Time To Complete Questionnaire
Lower*	Less than 15,599 $15,600 - $20,799 $15,600 - $20,799 $36,400 – 41,599 $36,400 – 41,599	72 80 59 (male) 72 55	Pensioner Pensioner/carer Pensioner Pensioner /Child Carer Relay officer	----- 35 minutes 28 minutes 70 minutes 35 minutes
Middle*	$41,600 - $51,999 $72,800 - $93.599 $72,800 - $93.599 $72,800 - $93.599	46 54 62 57	Relay officer Executive officer Admin officer Human Resources	30 minutes 25 minutes 30 minutes 30 minutes
Higher*	$93,600 – $129,999 More than $130 More than $130	60 51 63 (male)	Resource planner GP Company secretary	30 minutes 18 minutes 18 minutes

* Income level cut–off points are arbitrary

Appendix C3: Pilot study protocol - instructions to participants

How's your health?

A survey about **YOU**, **YOUR LIFESTYLE**, and a **HEALTH CAMPAIGN** for men and women aged **45 – 60 years**

Thank you for agreeing to help with the improvement of my questionnaire which will soon go out to 1600 Brisbane residents.

The survey has been approved by the Research Ethics Unit at Queensland University of Technology. A major part of the study looks at the language used in health campaigns and whether people understand the meanings of the words used in the health message. It doesn't matter whether you know the answers or not, **I only want to know whether the questions are easily understood**.

The purpose of piloting or trying out the questionnaire is to iron out any problems with the questions, their clarity and the layout before it is sent to a large number of people. So if it is not clear to you what a question is asking then there will be many other people as well that it won't be clear for. So, I need you to tell me this when we chat sometime soon after you have completed the questionnaire.

I am authorised to reimburse you $20 for your time which I will provide in cash when we discuss the questionnaire.

PROTOCOL for PILOT STUDY

- Please complete the questionnaire by yourself without help from anyone else. My aim is to make sure that everyone will be able to answer the questions.
- Please complete the questionnaire all at one time and note what time you started and what time you finished.
- As you answer the questions please think about (and make a note so that you remember to tell me):-

    - Whether the question is clear about what information was wanted.
    - Whether there are there too many or not enough instructions.
    - Were the arrows and "go to" instructions easy to follow.
    - What questions you found difficult or confusing.
    - What words you found difficult.
    - Anything else that you think is worth mentioning.

Again, many thanks for helping me with this important step in my research,

With best regards

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Appendix C4: Pilot study participant comments and action taken

Survey item	**Pilot participant comments (participant number in parentheses)**	**Response or Change to study questionnaire**
General impression & comments	(1)It was good for me. Made me go to bed thinking that I could do more. (2)Enjoyed doing it. Made me think. It made me realise things. (3)Front page too busy – lost the words."How's your health" should read along the line. (4) Generally fine – straight forward (5) Diabetes – felt uncomfortable with it like it was a test and pointing out how ignorant I was. (6) Easiest survey I have ever done – plain English. I thought the survey was a good learning tool (11)I liked the way it is, asking about health. When I couldn't understand I went to the dictionary. (12) Very serious, not entertaining, a bit clinical. Good questions and it was an education for me.	3. "How's your health now reads along the line. Font made larger. Two images removed. 5. Format of diabetes, chronic disease, cancer and heart disease changed. Stem removed and included in each statement.
Page 1: Introduction	(3) Not sure where it's going re. Measure Up, not explained enough. Should explain that there are 2 sections, health and lifestyle and Measure Up. (3) Don't say 'when you can', put in a date or time period. (4) Get rid of 'cross' in cross or tick the boxes.	3. Intro changed to: This study is in three parts. First we ask about your lifestyle and health knowledge. Next, we are very interested in your response to a recent health campaign called "Measure Up" and finally, we ask you questions about you and your household. 3. It was thought that this might sound a bit pushy so decided to leave wording unchanged. 4. 'cross' removed from wording.
Q 1.1	(10) 'Health' is too general	10. This is a standard item in SR health questionnaires. Left unchanged
Q 1.2	(3) Should say any 'type' of cancer	3. Changed
Q 1.3	(3) Explanation needs simplifying	3. Wording changed to 'Some examples of 1 serving are'...
Q 1.3 & 1.4	(3) 2nd option – can't have less than one serve	3. No action taken – thought by the team to be OK
Q 1.5	(5) Needs a serving size for a bread roll	5. No action taken – this is a standardised item

Survey item	**Pilot participant comments (participant number in parentheses)**	**Response or change to study questionnaire** *(continued)*
Q 1.6	(5) Should be a category for 'stopped 10 years ago'	5. No action taken – standardised item – categories are adequate
Q 1.7	(3) Needs 1-3 times per week	5. No action taken – standardised item
Q1.8	(1) some people might have trouble understanding 100 mls wine	1. No action taken – metric system has been in for 44 years
Q 1.9	(1) Does this include other forms of exercise such as cleaning and gardening? (5) Does this include cleaning, gardening and walking	1. & 5.Item wording changed to 'How many days per week do you usually do leisure time physical activity for at least 30 minutes?'
Q 1.10	7 participants said 'should be Yes / No' (1) Should have separate questions for mother and father (7) Need to add 'except' skin cancer to make it consistent with other question	Changed to Yes / No 1. No action taken – item includes both 7. 'except' added to item option
Q 1.11	(1) Re. Chronic disease – maybe should say lifestyle related (2) Participant circled 'most' chronic diseases. Said "lifestyle related chronic disease would work better. I immediately thought of asthma and epilepsy" (3) add 'can' to the first option – can last more than 6 months (3)Stem should say –'chronic disease <u>once contracted /once they occur/once established'</u> (6) Should change the order of 1.11 & 1,22 (6) Need a definition of chronic disease (6) Found it difficult to get into this section, found it difficult to grasp chronic disease, chronic disease is foreign to me	1. & 2. 'lifestyle related' added to all statements about chronic disease where appropriate. 3. 'can' added 3. Stem removed from top and added to each option 6. No action taken research team thought order was correct. 6. No action taken as this is the purpose of the item – to ascertain whether participants understand the term 'chronic disease'
Q 1.14	(5) The 3rd option – 'That <u>is easily</u> treated' Felt that any change in diet was not easy. Its a challenge going from high sugar to low sugar diet (6) What is the difference between Type 2 and Type 1	5. No action taken 6. No action taken – item not relevant to questionnaire

Survey item	**Pilot participant comments (participant number in parentheses)**	**Response / change to study questionnaire** *(continued)*
Q 1.15	(5) should say "long term disability OR death"	5. Changed
Q 1.16	(2) didn't know sells divided – knew they multiplied (5) 'in which' is confusing. Not clear. Lacks continuity.	2.Item simplified and incorporates 'multiplied' rather than divided (multiplied is end result, divided is the process) 5. Stem removed from top and added to each item
Q 1.17	(6) needs the measurement in inches	6. No action taken as ad is in metric and metric system in for 44 years
Q 2.2	(3) remove 'to what extent' there is only agree or disagree to choose	3. Removed
Q 2.3 & 2.4	(3) for consistency with other questions change instruction to 'please tick yes or no for each statement'	3. Changed
Q 2.4	(4 & 7) Need to remove '?' at end of 3rd option	4. & 7. Removed
Q 3.5		3. & 6. 'Don't Know' box inserted
Q 3.11	(3) What has telling them my income got to do with ensuring access to health info? Needs a statement about why you are asking for income. (4) What has my income got to do with my health?	3. & 4. Statement changed to be more informative about purpose. Now says "By answering this question you will help us ensure that all Brisbane residents are represented in the outcomes of this study thus informing strategies for equal access to health information"
Additional comments	(6) Need to put on the form that 'your personal details will not be used for any other purpose or be given to any third party". (8) Should have a question about "If you have made changes to lifestyle, what influenced that change? AND "If you have made changes, what influences the maintenance of those changes?'	6. This statement placed on back page near voluntary personal details for contact for follow up study. 8. These items are more suited to a qualitative study and may possibly be included in a follow up study. This item has been asked with reference to the *MeasureUp* campaign in this questionnaire.
	Writing on the front page should be darker or even black – some pictures look washed out.	Colour of questionnaire changed to blue. Writing larger and darker, 3 images removed to make writing more prominent.

Appendix D:

Sample Size Calculation

Sample Size Calculation

There are few reports of socioeconomic differences in respondents' knowledge or understanding of health campaign messages, and these studies have not presented results data in a form useable for calculation of sample size (Dixon et al., 1998; Hillsdon et al., 2001). In order to calculate the required sample size for a Brisbane population, a sample with similar characteristics that analysed a similar concept was sought.

Procedure

Four middle ranking food and nutrition knowledge items (% of 1000 respondents reporting the incorrect answer) in the Brisbane Food Study (Turrell & Kavanagh, 2007) were selected on the basis that they assessed understanding rather than knowledge. The data required for sample size calculations were not published in the article and so proportion results of these 4 items analysed by income and education level were provided by the author (G Turrell). The sample size was calculated in Excel using a formula governed by a 40% non-response rate and to give an 80% power. Four groups would be required for socioeconomic level analysis of the data in the current study.

In the following table, the proportion associated with the income or education level group with the highest proportion of participants obtaining the incorrect answer became Proportion A. Similarly, the proportion associated with the group with the lowest proportion of incorrect answers became Proportion B. The difference between the two proportions is presented in percentages for descriptive purposes. The sample size resulting from the sample size calculation in Excel is presented in the last column.

Table Appendix D: Proportion details for knowledge items used to calculate sample size

Item	Proportion A	Proportion B	Difference %	Group N
(i) Saturated fats are found in large quantities in butter, lard and dripping:				
Analysis by education	0.198	0.1115	8.65	435
Analysis by income	0.2139	0.1358	7.81	591
(ii) Bread, cereal, fruit and vegetables should make up the smallest part of our diet:				
Analysis by education	0.1278	0.0654	6.24	559
Analysis by income	0.1965	0.0593	13.72	143
(iii) Choosing salt-reduced foods provides no health benefit:				
Analysis by education	0.2632	0.1692	9.4	478
Analysis by income	0.3468	0.2484	9.8	539
(iv) Dietary fibre from whole meal foods combined with an adequate intake of drinking water prevents constipation:				
Analysis by education	0.1654	0.1038	6.16	769
Analysis by income	0.1965	0.116	8.05	507

Recommended sample sizes differed considerably between groups resulting in the calculated average difference between Proportion A and Proportion B of 8.72%. The closest actual difference in proportions to this average was for item (i) above which on analysis by education resulted in a difference of 8.65%. Thus this per group sample size (n=435) based on difference between proportions was seen as suitably typical for the study. A total sample size thus required for a 4 level (group) socioeconomic analysis is 1740 (i.e. 435 x 4).

Method

A starting figure is calculated using the proportions above in the following formula {Battistutta, 2007}**:**

Calculate A = proportion_1 x (1 – proportion_1)
Calculate B = proportion_2 x (1 – proportion_2)
Starting figure = $[10.5 \times (A + B)] / [\text{proportion}_1 - \text{proportion}_2]^2$

The inflation factor is calculated by adding the following quantities if applicable to the study:

1 + the proportion of non-respondents **(predicted to be 40% in this study) = 1.40**
1 + the proportion of non-attendees (not applicable in this study)
1 + proportion lost to follow up (not applicable in this study)

This figure is then multiplied by **1.15** if the study design is not experimental **(applicable)** and multiplied by 2.00 if the study uses cluster sampling (not applicable).

Calculation of the final sample is by multiplication of the starting figure by the inflation factor to give the minimum sample size per group that should be invited to participate in the study. These calculations were performed using an Excel calculation formula (provided by biostatistician Demitrios Vagenas), based on the above information to give a power of 80% with a type 1 error of 5% (two-tailed).

References for Power Calculation

Battistutta, D. (2007). Absolute essentials of sample size calculations. Research Methods Group Tip Sheet. In press.

Dixon, H., Borland, R., Segan, C., Stafford, H., Sindall, C. (1998). Public Reaction to Victoria's “2 Fruit ‘n’5 Veg Every Day” Campaign and Reported Consumption of Fruit and Vegetables. *Preventive Medicine.* 1998;27(4):572-82.

Hillsdon, M., Cavill, N., Nanchahal, K., Diamond, A., White, I.R. (2001). National level promotion of physical activity: results from England's ACTIVE for LIFE campaign. British Medical Journal. 55(10):755.

Turrell, G., Kavanagh, A. M. (2007). Socio-economic pathways to diet: modeling the association between socio-economic position and food purchasing behaviour. Public health nutrition. 9(03):375-83.

Appendix E:

Letters included in 'The Tailored Design Method'.

Appendix E.1: Pre-notification letter

How's your health?

< Name, address and date>

Dear

A few days from now you will receive an invitation to fill out a survey for an important research project being conducted by the Queensland University of Technology (QUT).
The survey looks at your health and lifestyle and a health campaign.
We are writing to you in advance because we have found that many people like to know ahead of time that they will be contacted. This survey is important and will help us improve access to information about health and illness for everyone.
A number of Brisbane residents have been randomly selected from the electoral role to complete the survey; you are one of these residents. The survey has been approved by the Australian Electoral Commission and QUT Research Ethics (see back of letter for details).
Thank you for your time and consideration. It is only with the generous help of people like you that we can better understand the health information needs of Brisbane residents.
Yours sincerely

Associate Professor Gavin Turrell
Senior NHMRC Research Fellow
Queensland University of Technology

P.S. We will be enclosing a small token of appreciation with the survey as a way of saying thanks.

Phone: (07) 3138 8291
Fax: (07) 3138 3130
E-mail: robin.armstrong@qut.edu.au
<ID>

How's your health?

Australian Electoral Commission Required Statement:

"The Australian Electoral Commission (AEC) has supplied name, address, gender and age-range information for this medical research project in conformity with item 2 of subsection 90B(4) of the *Commonwealth electoral Act 1918* and sub-regulation 9(a) of the Electoral and *Referendum Regulations 1940*. The information has been provided by the AEC on a confidential basis and may not be forwarded on or sold or otherwise disclosed or used for any purpose other than to contact participants for this medical research project"

QUT Ethics Statement

This study has been approved via QUT Research Ethics Protocols
(Ref. No 1000000199).
If you have any ethical concerns or complaints about this study, you may contact the QUT Research Ethics Officer on 3138 5123 or email ethicscontact@qut.edu.au

Appendix E2: Cover letter 1st mail-out

How's your health?

< Name, address, date>

Dear

I am writing to ask for your help with a health related survey being conducted by Queensland University of Technology. We would like to hear about your lifestyle and health and invite you to share your views about a recent health education campaign.

A number of Brisbane residents have been randomly selected from the Australian electoral roll to complete the survey; you are one of these residents. The survey has been approved by the Australian Electoral Commission and by QUT Research Ethics (see back of letter for details).

Results from the survey will be used to develop strategies and policies that will improve access to health information for all Brisbane residents. By understanding more about the health of Brisbane households and the health information that they might require, health educators will be able to plan strategies that more adequately meet the health information needs of all Brisbane residents. We believe that there are no risks involved in participation in this survey above normal day-to-day living.

Your answers are completely confidential and will be used only as summaries in which no individual's answers can be identified. The survey is voluntary. However, you can help us by sharing your experiences and opinions. Return of a completed survey will be regarded as consent to take part in the study. If for some reason you prefer not to respond please let us know by returning the blank survey in the reply paid envelope (no stamp needed).

We have enclosed a small token of appreciation with the survey as a way of saying thanks for your help.

If you have any questions or comments about this survey, we would be happy to speak with you. Please call Robin Armstrong on 3138 8291.

Thank you very much for helping us with this important study.
Yours sincerely

Associate Professor Gavin Turrell
Senior NHMRC Research Fellow
Queensland University of Technology
Phone: (07) 3138 8291
Fax: (07) 3138 3130
E-mail: robin.armstrong@qut.edu.au
<ID>

How's your health?

Australian Electoral Commission Required Statement:

"The Australian Electoral Commission (AEC) has supplied name, address, gender and age-range information for this medical research project in conformity with item 2 of subsection 90B(4) of the *Commonwealth Electoral Act 1918* and sub-regulation 9(a) of the Electoral and *Referendum Regulations 1940*. The information has been provided by the AEC on a confidential basis and may not be forwarded on or sold or otherwise disclosed or used for any purpose other than to contact participants for this medical research project".

QUT Ethics Statement

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If you have any ethical concerns or complaints about this study, you may contact the QUT Research Ethics Officer on 3138 5123 or email ethicscontact@qut.edu.au

Appendix E3: Postcard

(Reverse side of postcard)

<date >

Hello,

Last week a survey called '*How's your health?'* was mailed to you. The survey was about your lifestyle and health, and your views about a health campaign.

If you have already completed and returned the survey to us, **please accept our sincere thanks**. If not, can you please do so today? Your view and the information you provide is very important to us and will help in the planning of strategies that more adequately meet the health information needs of Brisbane residents'

If you did not receive the survey, or if it was misplaced, please call Robin Armstrong on **3138 8291** or email robin.armstrong@qut.edu.au and we will post another one to you today.

Thank you for your time and consideration. It is only with the generous help of people like you that our research can be successful.

Yours sincerely

Associate Professor Gavin Turrell
NHMRC Senior Research Fellow
Queensland University of Technology

POSTAGE PAID AUSTRALIA

Appendix E.4: Cover letter /replacement questionnaire

How's your health?

<Name, address, date>

Dear

About three weeks ago, we sent a survey to you that asked about your health and lifestyle and a health promotion campaign. To the best of our knowledge, your survey has not been returned.

The comments of people who have already responded have been very helpful. Many have provided very useful information about their health and lifestyle and their responses to a health promotion campaign. The results of this study will help improve access to health information for all Brisbane residents.

We are writing to you again because your survey answers are important to the study and will help make sure that our results are accurate. Although we sent surveys to other people in Brisbane, it is only by hearing back from nearly everyone that we can be sure that results reflect the views of all residents. I have enclosed another copy of the survey with this letter. We would be very grateful if you would fill in the survey and send it back to us as soon as possible.

Please let me reassure you that your survey answers are strictly confidential and will be used only as summaries where no individual's answers can be identified. The survey has been approved by the Australian Electoral Commission and by QUT Research Ethics (see back of letter for details). We hope that you will fill out and return the survey soon, but if for any reason you prefer not to answer it, please let us know by returning the blank survey in the reply-paid envelope (no stamp needed).

Yours sincerely

Associate Professor Gavin Turrell
Senior NHMRC Research Fellow
Queensland University of Technology
Phone: (07) 3138 8291
Fax: (07) 3138 3130
E-mail: robin.armstrong@qut.edu.au
<ID>

How's your Health?

Australian Electoral Commission Required Statement:
"The Australian Electoral Commission (AEC) has supplied name, address, gender and age-range information for this medical research project in conformity with item 2 of subsection 90B(4) of the *Commonwealth electoral Act 1918* and sub-regulation 9(a) of the Electoral and *Referendum Regulations 1940*. The information has been provided by the AEC on a confidential basis and may not be forwarded on or sold or otherwise disclosed or used for any purpose other than to contact participants for this medical research project"

QUT Ethics Statement
This study has been approved via QUT Research Ethics Protocols
(Ref. No 1000000199).

If you have any ethical concerns or complaints about this study, you may contact the QUT Research Ethics Officer on 3138 5123 or email ethicscontact@qut.edu.au

Appendix E.5: Final reminder letter

How's your Health?

<Name, address, date>

Dear

During the past 6 weeks we have sent you several mailings about an important research study being conducted by Queensland University of Technology (QUT).
The purpose of the research is to obtain information for the development of policies that will improve access to health information for all Brisbane residents. The results will improve accessibility to health information.

The study is coming to a close and this will be the last contact that will be made with those residents randomly selected from the electoral roll.
We are sending out this final contact because of our concern that people who have not responded may have different views than those who have. Hearing from everyone who was selected in Brisbane helps make sure that the survey results are as accurate as possible.

We would like to assure you that your participation is voluntary, and if you would prefer not to respond that is fine. If you do not want to participate, please let us know by returning the blank survey in the reply-paid envelope (no stamp needed). This would be very helpful.

Finally, we appreciate your willingness to consider our request as we conclude this effort to better understand the health information needs of Brisbane residents. Thank you again.

Yours sincerely

Associate Professor Gavin Turrell
Senior NHMRC Research Fellow
Queensland University of Technology

Phone: (07) 3138 8291
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E-mail: robin.armstrong@qut.edu.au
<ID>

How’s your Health?

Australian Electoral Commission Required Statement:

“The Australian Electoral Commission (AEC) has supplied name, address, gender and age-range information for this medical research project in conformity with item 2 of subsection 90B(4) of the *Commonwealth electoral Act 1918* and sub-regulation 9(a) of the Electoral and *Referendum Regulations 1940*. The information has been provided by the AEC on a confidential basis and may not be forwarded on or sold or otherwise disclosed or used for any purpose other than to contact participants for this medical research project”

QUT Ethics Statement

This study has been approved via QUT Research Ethics Protocols (Ref. No. 000000199).

If you have any ethical concerns or complaints about this study, you may contact the QUT Research Ethics Officer on 3138 5123 or email ethicscontact@qut.edu.au

Appendix F:

Age And Gender & Outcome Variables.

Table F1. Relationships between age and gender, and awareness of the Measure Up campaign

Analytical Sample (*N* = 984)	Aware of campaign (n = 845)		Not aware of campaign (n = 139)		
	n	%	n	%	*p. value*
Age					
45-50	303	88.3	40	11.7	
51-55	262	83.7	51	16.3	*0.223*
56-60	280	85.4	48	14.6	
Gender					
Females	445	85.6	75	14.4	*0.848*
Males	400	86.2	64	13.8	

[1] N = 845 respondents aware of the *Measure Up* campaign.
[2] p.value may be unreliable due to cell counts < 5.

Table F2. Relationships between age, gender and media channel exposure

	TV (n=842)		Radio (n=841)		Bus shelter (n=842)		Shopping centre (n=842)		News/ Mags (n=842)		Shopping trolley (n=842)		Saw but Forgot (n=842)	
Exposed	n 791	% 93.9	n 73	% 8.7	n 127	% 15.1	n 130	% 15.4	n 289	% 34.3	n 26	% 3.1	n 13	% 1.5
Age														
45-50	283	93.4	25	8.3	61	20.1	45	14.9	99	32.7	11	3.6	4	1.3
51-55	248	95.0	27	10.3	30	11.5	48	18.4	97	37.2	9	3.4	5	1.9
56-60	260	93.5	21	7.6	36	12.9	37	13.3	93	33.5	6	2.2	4	1.4
p.value	*0.679*		*0.495*		***0.008***		*0.248*		*0.498*		*0.545*		*0.836*[1]	
Gender														
Females	411	93.0	36	8.1	69	15.6	79	17.9	171	38.7	16	3.6	8	1.8
Males	380	95.0	37	9.3	58	14.5	51	12.8	118	29.5	10	2.5	5	1.3
p.value	*0.281*		*0.647*		*0.724*		***0.050***		***0.006***		*0.460*		*0.705*	

Table F3. Relationships between age and gender and knowledge about Cancer

Knowledge Item	% Incorrect[1]						
	Age				Gender		
	45 – 50	51 – 55	56 – 60	p. value	Female	Male	p. value
Knowledge about the condition							
Cancer is an illness than can occur at any age	1.0	0.8	1.4	0.751	0.9	1.3	0.611
Cancer is an illness in which abnormal cells multiply and are able to invade other cells	7.0	7.4	8.3	0.848	6.1	9.1	0.102
Cancer is an illness that always forms a lump so you know when you have it.	4.4	11.2	7.5	**0.010**	6.1	9.1	0.098
Knowledge about health effects							
Cancer is an illness that is a major cause of death in the Australian population.	15.1	16.2	11.1	0.196	16.7	11.2	**0.021**
Knowledge about current risk and prevention							
Cancer is an illness in which some cases can be prevented by keeping a healthy weight, being physically active and eating a healthy diet.	36.2	36.3	43.4	0.138	39.6	37.6	0.547

[1]Total sample (N = 845) includes only those respondents who are aware of the campaign.

Table F4. Relationships between age and gender, and knowledge about Lifestyle Related Chronic Disease

Knowledge Item	% Incorrect[1]						
	Age				Gender		
	45–50	51–55	56 – 60	p. value	Female	Male	p. value
Knowledge about the condition							
LRCD[2] can last more than 6 months and keep coming back.	21.5	24.7	25.1	0.548	24.1	23.2	0.757
LRCD only occur in the elderly.	5.4	6.6	9.0	0.222	6.1	7.8	0.331
LRCD can be quickly cured with medication.	18.9	19.5	22.6	0.498	17.6	23.3	**0.041**
LRCD is too late to do anything about.	10.4	9.7	16.2	**0.036**	11.4	12.9	0.493
Knowledge about health effects							
LRCD can result in pain, disability or death.	6.4	9.3	12.3	**0.051**	10.0	8.4	0.419
Knowledge about current risk and prevention							
LRCD can be prevented by regular physical activity.	28.9	34.6	41.9	**0.005**	35.5	34.4	0.754
My risk of LRCD would be <u>increased</u> if my waistline measurement was greater than 94 cm (males) or 80cm (females).	12.0	8.4	12.5	0.253	10.2	12.1	0.366
My risk of LRCD would be <u>decreased</u> if I was physically active for more than 30 minutes each day.	8.7	8.4	10.8	0.588	9.5	9.1	0.863
My risk of LRCD would be <u>increased</u> if I regularly ate less than 2 serves of fruit & 5 vegetables each day.	39.5	42.1	39.1	0.731	36.6	44.2	**0.025**
My risk of LRCD would be <u>decreased</u> if I drank mainly water throughout the day.	38.5	38.7	46.9	0.069	41.5	41.1	0.902

[1] Total sample (N = 845) includes only those respondents aware of the *Measure Up* campaign.
[2] LRCD = Lifestyle Related Chronic Disease.

Table F5. Relationships between age and gender and knowledge about Type 2 Diabetes

Knowledge Item	% Incorrect[1]						
	Age				Gender		
	45-50	51–55	56–60	p. value	Female	Male	p. value
Knowledge about the condition							
People who have excess weight around their waistline are at higher risk for diabetes.	12.1	15.1	15.8	0.403	13.3	15.2	0.437
Type 2 diabetes is a condition that causes there to be too much sugar in the blood.	34.2	34.1	35.4	0.942	34.3	34.9	0.870
Type 2 diabetes is a condition in which the body does not produce enough insulin or the insulin does not work properly.	26.2	22.5	22.4	0.477	20.5	27.5	**0.017**
Type 2 diabetes is a condition that is easily treated by simply not eating sugar.	25.9	25.3	24.2	0.890	18.9	32.1	**0.001**
Type 2 diabetes is a condition that only affects elderly people.	8.8	7.0	9.4	0.588	7.0	9.9	0.132
Type 2 diabetes is a condition in which glucose cannot get from the bloodstream into the body cells.	69.5	70.3	74.7	0.341	69.9	73.2	0.294
Knowledge about health effects							
If a person has diabetes they are much more likely to experience heart attack.	40.9	38.2	33.9	0.220	37.9	37.7	0.950
If a person has diabetes they are much more likely to experience skin cancer.	38.0	39.3	40.8	0.787	35.0	44.1	**0.007**
If a person has diabetes they are much more likely to experience blindness.	25.5	20.5	23.6	0.370	17.9	29.3	**0.001**
If a person has diabetes they are much more likely to experience stroke.	40.6	36.2	33.1	0.172	33.4	40.5	**0.034**
If a person has diabetes they are much more likely to experience kidney damage.	37.6	35.4	35.1	0.800	30.1	42.7	**0.001**
If a person has diabetes they are much more likely to experience loss of limb.	32.9	18.5	20.9	**0.001**	17.6	32.1	**0.001**
If a person has diabetes they are much more likely to experience impotence.	69.0	58.4	58.4	**0.010**	59.2	65.6	**0.058**
Knowledge about current risk and prevention							
Type 2 diabetes is a condition that is preventable by keeping a healthy weight, taking daily physical activity and making good food choices.	19.5	13.6	16.8	0.179	14.1	19.8	**0.027**

[1] Excludes 9-21 respondents who did not answer items about diabetes, 139 respondents unaware of the *MeasureUp* campaign, and 75 who did not provide any socioeconomic data.

Table F6. Relationships between age and gender and knowledge about Heart Disease

Knowledge Item	% Incorrect[1]						
	Age				Gender		
	45 – 50	51 – 55	56 – 60	p. value	Female	Male	p. value
Knowledge about the condition							
Heart disease is also known as coronary heart disease or coronary artery disease.	10.1	11.2	16.5	**0.050**	10.9	14.5	0.119
Heart disease is a condition in which blood vessels to the lungs become blocked making it hard to breathe.	45.6	49.0	54.3	0.111	51.8	47.1	0.171
Heart disease develops over time with gradual blocking of one or more blood vessels that feed the heart muscle.	7.0	7.8	9.4	0.584	8.6	7.4	0.499
Heart disease may first show as heart pain or angina.	16.8	16.0	19.8	0.473	18.5	16.5	0.450
Heart attack is a severe form of heart disease in which part of the heart muscle dies.	34.5	31.5	29.5	0.438	34.0	29.5	0.164
Heart attack can be cured by medications that thin the blood.	52.5	56.0	57.5	0.475	54.6	56.0	0.682
Knowledge about health effects							
Heart attack can lead to long term disability or death.	6.0	7.3	5.7	0.723	7.5	5.1	0.157
Knowledge about current risk and prevention							
Heart attack is preventable by being physically active each day, making healthy food choices and keeping body weight down.	13.5	18.1	18.8	0.176	17.0	16.3	0.769
I would consider myself at risk for heart disease if one of my parents were to die of heart attack.	27.0	25.9	22.9	0.513	24.9	25.7	0.802

[1]Total sample (N = 845) includes only those respondents who are aware of the campaign.

Table F7. Relationships between age and gender and knowledge about Overweight

Knowledge Item	% Incorrect[1]						
	Age				Gender		
	45 – 50	51 – 55	56 – 60	p. value	Female	Male	p. value
Knowledge about current risk and prevention							
Being overweight increases risk of :- Skin cancer.	23.4	23.8	20.4	0.575	20.6	24.7	0.156
Breast cancer (post menopause).	72.3	73.2	73.8	0.916	64.3	82.8	**0.001**
Prostate cancer.	76.9	80.5	79.6	0.554	78.1	79.8	0.537
Leukaemia.	47.7	49.0	50.0	0.855	42.8	55.7	**0.001**
Bowel cancer.	59.1	59.4	60.9	0.889	55.3	64.8	**0.005**
Knowledge about the condition							
If you have a large waist line this may mean that:- you have too much fat inside your abdomen.	31.2	30.7	29.3	0.883	29.7	31.2	0.631
over time, you have taken in more energy than you have burnt off leading to an energy imbalance.	13.9	19.2	18.2	0.191	18.4	15.4	0.247
Knowledge about health effects							
fat coats your heart, kidneys, liver, and pancreas increasing your risk of serious illness.	21.2	23.4	22.1	0.824	20.6	23.9	0.245
Knowledge about current risk and prevention							
you should eat less snack and take away foods.	8.3	6.5	8.3	0.668	8.4	7.1	0.476
you should eat more vegetables, fruit and lean meat.	8.3	7.7	5.4	0.386	6.1	8.3	0.216
you should be moderately active for at least 30 minutes each day.	4.6	4.6	4.4	0.987	4.3	4.8	0.735

[1]Total sample (N = 845) includes only those respondents who are aware of the campaign.

Table F8. Relationship between age and gender and prompting of proximal behaviours

Item	% [1]prompted to engage in behaviour						
	Age				Gender		
	45 – 50	51 – 55	56 – 60	p. value	Female	Male	p. value
The *Measure Up* campaign ads have prompted me to:-							
Measure my waistline	31.5	42.8	39.3	**0.019**	41.0	33.8	**0.039**
Weigh myself	48.7	52.9	53.1	0.486	48.2	55.1	0.055
Increase my physical activity	46.3	49.6	53.3	0.249	52.0	47.1	0.184
Increase my fruit and vegetable consumption	38.3	43.0	51.5	**0.006**	46.4	41.6	0.181

[1] Total population N = 845 excludes 139 respondents who were unaware of the *Measure Up* campaign and 75 respondents who did not provide any SE information. Missing data ranges 13-15 over the set of items.

Table F9. Relationships between age and gender and not having access to a computer

Predictor	Total population (N[1] = 845)	Did not have computer access (n =73)		
	Sample n[2] = 793	n	%	p. value
Age				
				0.081
45 – 50	282	18	6.4	
51 – 55	251	24	9.6	
56 – 60	260	31	11.9	
Gender				
				0.242
Female	410	43	10.5	
Male	383	30	7.8	

1 Total population N = 845 (excluded from the original sample of 1065 are 139 respondents who were unaware of the *Measure Up* campaign, 6 who did not answer the awareness item, and 75 respondents who did not provide any SE information).

2 Sample n = 793 excludes 26 respondents who went online to the *Measure Up* website and 26 respondents who did not answer this item.

Table F10. Relationships between age, gender and those who had computer access but did not go online

Predictor	Total population (N[1] = 845)	Had computer access but did not go online (n =720)		
	Sample n[2]	**n**	**%**	**p. value**
Age				
	(793)			*0.081*
45 – 50	282	264	93.6	
51 – 55	251	227	90.4	
56 – 60	260	229	88.1	
Gender				
	(793)			*0.242*
Female	410	367	89.5	
Male	383	353	92.2	

[1] Total population N = 845 (excluded from the original sample of 1065 are 139 respondents who were unaware of the *Measure Up* campaign, 6 who did not answer the awareness item, and 75 respondents who did not provide any SE information).
[2] Sample n = 793 excludes 26 respondents who went online to the *Measure Up* website and 26 respondents who did not answer this item.

Appendix G:

Analysis of the Media Channel Exposure Index and Understanding Indices

Advice to determine appropriate method for analysis of the Media Channel Exposure Index (MCEI)and Understanding Indices

Advice was sought from the QUT Research Methods Group regarding the most appropriate analytical method to explore the effects of SEP on the indices (MCEI and chronic disease/ risk factor 'Understanding Indices' discussed later in this chapter). Multivariable Linear Regression (MLR) was chosen instead of Polytomous Logistic Regression for two reasons. Firstly, because there are too many categories in most of the indices (< 5 is recommended, but scores summed to comprise the indices in this study range from 5 to 14). Secondly, even though the indices were measured as discrete variables, the underlying scores are continuous (Dr D. Vagenas, Research Methods Group, personal communication, November 3, 2011).

MLR was used to determine differences in the average MCEI when analysed with the explanatory variables, SEP (Education level, Occupation, Income level), Age, and Gender. Each of these explanatory variables has multiple categories such as 'Education level' has the categories Bachelor degree or higher, Diploma / Associate degree, Certificate / Trade, No post-school qualifications.

In MLR more than one explanatory variable can be incorporated into the model giving a more comprehensive description of the outcome variable, and also more certainty in its effect by removal of other explanatory variables (Lewis-Beck, 2004). The Beta coefficient (β) refers to the mean change in Y (Index) for every unit change in X (each level of each explanatory variable) when all other explanatory variables are held constant (Lewis-Beck, 2004). In this analysis β reflects the mean Index score at each level of the explanatory variable. The unique contribution of each SEP indicator, Education, Occupation, and Income is determined by comparing models in which the SEP indicators are simultaneously adjusted for the effects of each other and for Age and Gender.

Thus the relationship between SEP and the number of media channels by which participants were exposed to *MeasureUp* campaign information was examined using

Multiple Linear Regression analysis. Four age and gender adjusted models were compared, simultaneously adjusting for education level, occupational status, and yearly household income.

Progression with the above analyses were curtailed however when it was found that SPSS software (version 18) used for analysis in this study was unable to perform MLR on a data set that included missing data values. In order to determine whether missing Income level data (n = 124) could be removed from the analysis without any notable loss of precision in other SEP data values, advice was sought from SPSS and Research Methods advisors at QUT. (emails Ray Duplock, 4-7 Nov. 2011, RMG Stats Clinic).

Procedure for determining effects of missing Income level data values

Subsequently a missing data imputation procedure using 5 data replications was performed (SPSS Version 18) to impute missing data values, and MLR was performed on this data set. The resulting MLR coefficients were then compared to the MLR coefficients in the same data set but with the missing data values excluded from the analysis (Mr. R. Duplock, November, 2011). Two data sets were used for comparison. The first set was that of the Type 2 Diabetes Understanding Index which was comprised of the sum of 14 scores for knowledge items on that subject; the second set was that of the Cancer Understanding Index comprised of the sum of 5 scores. Within each set, 2 models of comparisons were made between MLR outcomes (see Appendix G, Models 1a, 1b, and Models 2a, 2b).

Model 1a compares the ‘missing data imputed’ and ‘missing data excluded’ data sets. MLR coefficients depict Income level differences (adjusted for age and gender) in respondents’ mean ‘Type 2 Diabetes Understanding Index’. Model 1b differs from 1a in that it also includes Education level and Occupational status coefficients to determine any loss of precision in these data. Models 2a and 2b make the same comparisons in the ‘Cancer Understanding Index’, a different chronic disease risk factor (CDRF) subscale with fewer items. Statistical significance was maintained and differences in the compared data sets were minimal (Dr D. Vagenas, personal communication, November, 2011). Thus subsequent to these procedures the missing Income data was excluded from the MLR analyses of Indices.

Comparison of Multivariable Linear Regression coefficients when missing income data is excluded and when missing data is imputed

This comparison was performed in order to determine whether missing income level data (n = 124) could be removed from the analysis without any notable loss of precision in other socioeconomic data values. A missing data imputation procedure using 5 data replications was performed to impute missing data values and Multiple Linear Regression (MLR) was performed on this data set.

The resulting MLR coefficients were then compared to the MLR coefficients in the same data set but with the missing data values excluded. Two data sets were used for comparison. The first set was that of the Type 2 Diabetes Understanding Index which was comprised of the sum of 14 scores for knowledge items on that subject (Models 1a and 1b); the second set was that of the Cancer Understanding Index comprised of the sum of 5 scores (Models 2a and 2b). Within each set, 2 models of comparisons were made between MLR outcomes .

Model 1a compares the missing data imputed and missing data excluded data sets and presents MLR coefficients depicting age and gender adjusted income level differences in respondent's mean Understanding Index for Type 2 Diabetes. Model 1b differs from 1a in that it also includes Education level and Occupational status coefficients to determine any loss of precision in these data. Models 2a and 2b make the same comparisons but in the different sized and subject matter Cancer Understanding Index.

Reference.

Lewis-Beck, M. S., Bryman, A., & Liao, T. F. (2004). *The Sage encyclopedia of social science research methods*. Thousand Oaks, California: Sage.

Model 1a. Income adjusted for age and gender: Understanding Index Type 2 Diabetes

	With missing data excluded			With imputed data included		
	β	**(95%) CI**	**p.value**	**β**	**(95%) CI**	**p.value**
High	1.00	--	--	1.00	--	--
Middle	-0.040	-0.919; 0.287	0.304	-0.060	-1.017; 0.106	0.112
Low-middle	-0.039	-0.957; 0.314	0.320	-0.021	-0.813; 0.455	0.580
Low	-0.119	-2.233; -0.546	**0.001**	-0.106	-2.142; -0.474	**0.002**
Age 45-50	1.00	--	--	1.00	--	--
Age 51-55	0.051	-0.190; 0.977	0.186	0.054	-0.136; 0.983	0.138
Age 56-60	0.086	0.073; 1.250	**0.028**	0.089	0.138; 1.257	**0.015**
Female	1.00	--	--	1.00	--	--
Male	-0.184	-1.811; -0.852	**0.001**	-0.161	-1.643; -0.727	**0.001**

Model 1b. Income, education and occupation adjusted for age and gender: Understanding Index Type 2 Diabetes

	With missing data excluded			With imputed data included		
	β	**(95%) CI**	**p.value**	**β**	**(95%) CI**	**p.value**
High	1.00	--	--	1.00	--	--
Middle	-0.008	-0.679; 0.547	**0.001**	-0.023	-0.751; 0.395	0.542
Low-middle	-0.019	-0.523; 0.826	0.660	0.025	-0.443; 0.879	0.518
Low	-0.077	-1.847; 0. 012	**0.053**	-0.062	-1.647; 0.122	0.091
Bachelor/ Higher	1.00	--	--	1.00	--	--
Diploma/ Ass. degree	-0.062	-1.436; 0.123	0.099	-0.063	-1.419; 0.058	0.071
Certificate/ Trade	-0.067	-1.429; 0.129	0.102	-0.074	-1.456; 0.002	**0.051**
No post-school	-0.195	-2.197; -0.848	**0.001**	-0.184	-2.067; -0.811	**0.001**
Managers/ Profs	1.00	--	--	1.00	--	--
White collar	-0.001	-0.672; 0.649	0.973	0.012	-0.521; 0.718	0.755
Blue collar	0.002	-0.812; 0.853	0.961	-0.001	-0.811; 0.799	0.988
Not Easily Classified	-0.002	-0.848; 0.812	0.966	-0.015	-0.893; 0.593	0.692
Age 45-50	1.00	--	--	1.00	--	--
Age 51-55	0.052	-0.178; 0.986	0.174	0.053	-0.139; 0.971	0.142
Age 56-60	0.105	0.213; 1.406	**0.008**	0.108	0.280; 1.408	**0.003**
Female	1.00	--	--	1.00	--	--
Male	-0.184	-1.840; -0.833	**0.001**	-0.162	-1.673; -0.713	**0.001**

Model 2a. Income adjusted for age and gender: Understanding Index for Cancer

	With missing data excluded			With imputed data included		
	β	(95%) CI	p.value	β	(95%) CI	p.value
High	1.00	--	--	1.00	--	--
Middle	-0.040	-0.919; 0.287	0.304	-0.060	-1.017; 0.106	0.112
Low-middle	-0.039	-0.957; 0.314	0.320	-0.021	-0.813; 0.455	0.580
Low	-0.119	-2.233; -0.546	**0.001**	-0.106	-2.142; -0.474	**0.002**
Age 45-50	1.00	--	--	1.00	--	--
Age 51-55	0.051	-0.190; 0.977	0.186	0.054	-0.136; 0.983	0.138
Age 56-60	0.086	0.073; 1.250	**0.028**	0.089	0.138; 1.257	**0.015**
Female	1.00	--	--	1.00	--	--
Male	-0.184	-1.811; -0.852	**0.001**	-0.161	-1.643; -0.727	**0.001**

Model 2b. Income, education and occupation adjusted for age and gender: Understanding Index for Cancer

	With missing data excluded			With imputed data included		
	β	(95%) CI	p.value	β	(95%) CI	p.value
High	1.00	--	--	1.00	--	--
Middle	-0.018	-0.208; 0.131	0.657	-0.024	-0.210; 0.108	0.529
Low-middle	-0.019	-0.229; 0.145	0.663	0.009	-0.163; 0.204	0.827
Low	-0.107	-0.603; -0. 088	**0.009**	-0.074	-0.499; -0.007	**0.044**
Bachelor/Higher	1.00	--	--	1.00	--	--
Diploma/Assoc degree	-0.033	-0.310; 0.122	0.394	-0.043	-0.331; 0.079	0.229
Certificate/ Trade	-0.062	-0.378; 0.054	0.140	-0.037	-0.301; 0.104	0.341
No post-school Qual	-0.154	-0.515; -0.141	**0.001**	-0.133	-0.461; -0.112	**0.001**
Managers/Profs	1.00	--	--	1.00	--	--
White collar	0.013	-0.154; 0.212	0.757	-0.028	-0.235; 0.110	0.474
Blue collar	-0.031	-0.316; 0.145	0.467	-0.063	-0.411; 0.037	0.102
Not Easily Classified	-0.017	-0.278; 0.183	0.685	-0.061	-0.371; 0.042	0.118
Age 45-50	1.00	--	--	1.00	--	--
Age 51-55	-0.006	-0.174; 0.148	0.874	-0.016	-0.188; 0.129	0.120
Age 56-60	0.046	-0.068; 0.263	0.247	0.033	-0.086; 0.228	0.378
Female	1.00	--	--	1.00	--	--
Male	-0.043	-0.225; 0.054	0.231	-0.037	-0.209; 0.058	0.267

Appendix H:

Sensitivity test for conversion of Understanding Indices to categorical variables

Sensitivity test for conversion of Understanding Indices to categorical variables

The continuous variable 'Understanding Index' was converted to a categorical variable. A sensitivity test was conducted to minimise the potential for loss of information when continuous data are converted to categorical data (Woodward, 2005, p93). The aim was to create the smallest number of categories for analysis and at the same time maintain optimum sensitivity. Understanding Index scores were converted to tertile, quartile, and quintile categorical variable models (Tables H1, H2 and H3). Each model was entered separately into logistic regression analyses to determine the likelihood of respondents with each level of Understanding Index score engaging in each proximal behaviour. The outcomes were examined for differences. There was essentially little difference between each of the models and thus tertile grouping of the Understanding Index scores was utilised for the subsequent logistic regression analysis.

Table H1. Relationships between Understanding Indexes (in TERTILES) and proximal behaviour

CDRF[1] category	UIx[2] Score (tertiles)	Measured waist OR (95%) CI	Measured weight OR (95%) CI	Increased physical activity OR (95%) CI	Increased fruit and vegetables OR (95%) CI	Talked to doctor OR (95%) CI
Cancer	High	1.00 --	1.00 --	1.00 --	1.00 --	1.00 --
	Medium	0.85 0.63, 1.16	0.89 0.66, 1.21	1.01 0.75, 1.37	1.12 0.83, 1.52	1.22 0.83, 1.80
	Low	**0.62 0.40, 0.96**	0.91 0.61, 1.36	0.88 0.59, 1.31	0.84 0.56, 1.26	1.19 0.71, 1.98
Lifestyle Related Chronic Disease	High	1.00 --	1.00 --	1.00 --	1.00 --	1.00 --
	Medium	0.87 0.60, 1.26	0.88 0.61, 1.27	1.02 0.71, 1.46	1.09 0.75, 1.57	1.03
	Low	**0.63 0.45, 0.88**	0.79 0.58, 1.08	0.80 0.58, 1.09	0.84 0.61, 1.15	1.09 0.73, 1.61
Type 2 Diabetes	High	1.00 --	1.00 --	1.00 --	1.00 --	1.00 --
	Medium	0.97 0.69, 1.37	1.04 0.75, 1.45	1.04 0.75, 1.46	0.87 0.62, 1.22	0.78
	Low	**0.68 0.47, 0.97**	0.87 0.62, 1.24	0.81 0.57, 1.15	**0.68 0.48, 0.96**	0.66 0.42, 1.03
Heart Disease	High	1.00 --	1.00 --	1.00 --	1.00 --	1.00 --
	Medium	1.02 0.71, 1.48	1.28 0.89, 1.83	**1.45 1.01, 2.07**	1.22 0.85, 1.75	**2.51 1.59, 3.95**
	Low	0.82 0.59, 1.13	1.00 0.73, 1.37	0.89 0.65, 1.22	1.01 0.73, 1.39	1.44 0.93, 2.23
Overweight	High	1.00 --	1.00 --	1.00 --	1.00 --	1.00 --
	Medium	0.73 0.52, 1.04	0.89 0.63, 1.25	1.11 0.78, 1.56	0.95 0.67, 1.34	0.89 0.57, 1.40
	Low	**0.54 0.37, 0.79**	**0.66 0.46, 0.95**	0.86 0.60, 1.24	0.87 0.61, 1.26	1.06 0.67, 1.68

1 CDRF = Chronic Disease Risk Factor area
2 UIx = Understanding Index

Table H2. Relationships between Understanding Indexes (by QUARTILE) and proximal behaviour

CDRF[1] category	UIx[2] Score (quartiles)	Measured waist OR (95%) CI	Measured weight OR (95%) CI	Increased physical activity OR (95%) CI	Increased fruit and vegetables OR (95%) CI	Talked to doctor OR (95%) CI
Cancer	High (4)	1.00 --	1.00 --	1.00 --	1.00 --	1.00 --
	Medium (3)	0.85 0.63, 1.16	0.89 0.66, 1.21	1.01 0.75, 1.37	1.12 0.83, 1.52	1.22 0.83, 1.80
	Low-med (2)	0.66 0.40, 1.10	0.82 0.51, 1.31	0.92 0.58, 1.47	0.76 0.47, 1.24	1.07 0.58, 1.95
	Low (1)	0.52 0.25, 1.11	1.16 0.59, 2.25	0.78 0.40, 1.52	1.02 0.51, 1.20	1.48 0.67, 3.26
Lifestyle Related Chronic Disease	High	1.00 --	1.00 --	1.00 --	1.00 --	1.00 --
	Medium	0.94 0.63, 1.42	0.98 0.65, 1.46	0.82 0.55, 1.23	**0.54** **0.36, 0.82**	0.92 0.54, 1.54
	Low-med	0.82 0.56, 1.20	0.84 0.58, 1.23	0.89 0.61, 1.30	0.79 0.54, 1.15	1.14 0.71, 1.83
	Low	**0.52** **0.33, 0.81**	0.77 0.51, 1.18	**0.64** **0.42, 0.98**	**0.51** **0.34, 0.81**	0.83 0.48, 1.45
Type 2 Diabetes	High	1.00 --	1.00 --	1.00 --	1.00 --	1.00 --
	Medium	1.12 0.78, 1.62	1.11 0.77, 1.59	0.95 0.66, 1.37	0.92 0.64, 1.32	0.82 0.52, 1.29
	Low-med	0.86 0.57, 1.31	1.07 0.71, 1.60	1.19 0.79, 1.79	0.85 0.56, 1.28	0.62 0.36, 1.06
	Low	**0.55** **0.37, 0.82**	0.76 0.52, 1.10	0.76 0.52, 1.10	**0.60** **0.41, 0.88**	0.70 0.44, 1.13
Heart Disease	High	1.00 --	1.00 --	1.00 --	1.00 --	1.00 --
	Medium	0.82 0.50, 1.32	0.72 0.45, 1.15	1.18 0.73, 1.89	1.13 0.70, 1.82	2.14 0.98, 4.69
	Low-med	0.84 0.54, 1.31	0.98 0.63, 1.52	1.41 0.91, 2.17	1.31 0.84, 2.04	**3.78** **1.83, 7.83**
	Low	0.67 0.41, 1.11	0.72 0.44, 1.17	0.85 0.52, 1.38	0.94 0.57, 1.55	1.92 0.86, 4.30
Overweight	High	1.00 --	1.00 --	1.00 --	1.00 --	1.00 --
	Medium	0.73 0.52, 1.04	0.89 0.63, 1.25	1.11 0.78, 1.56	0.95 0.67, 1.34	0.89 0.57, 1.40
	Low-med	0.71 0.45, 1.12	0.79 0.51, 1.24	0.98 0.63, 1.53	1.06 0.68, 1.66	1.03 0.59, 1.82
	Low	**0.42** **0.26, 0.67**	**0.57** **0.37, 0.87**	0.77 0.50, 1.18	0.74 0.48, 1.13	1.08 0.64, 1.84

Table H3. Relationships between Understanding Indexes by QUINTILE and proximal behaviour

CDRF[1] category	UIx[2] Score (quintiles)	Measured waist OR (95%) CI	Measured weight OR (95%) CI	Increased physical activity OR (95%) CI	Increased fruit and vegetables OR (95%) CI	Talked to doctor OR (95%) CI
Cancer	High (5)	1.00	1.00	1.00	1.00	1.00
	Medium (4)	0.85 0.63, 1.16	0.89 0.66, 1.21	1.01 0.75, 1.37	1.12 0.83, 1.52	1.23 0.83, 1.80
	Low-med (3)	0.66 0.40, 1.10	0.82 0.51, 1.30	0.92 0.58, 1.47	0.76 0.47, 1.24	1.07 0.59, 1.96
	Low (2)	0.66 0.26, 1.69	0.95 0.39, 2.29	0.72 0.30, 1.75	1.10 0.46, 2.68	2.32 0.90, 6.00
	Low-low (1)	0.36 0.10, 1.26	1.47 0.55, 3.89	0.86 0.33, 2.23	0.94 0.35, 2.48	0.66 0.15, 2.95
Lifestyle Related Chronic Disease	High	1.00	1.00	1.00	1.00	1.00
	Medium	0.94 0.63, 1.42	0.98 0.65, 1.46	0.82 0.55, 1.23	**0.55** **0.36, 0.82**	0.92 0.54, 1.55
	Low-med	0.84 0.55, 1.30	0.87 0.57, 1.32	0.92 0.60, 1.40	0.80 0.52, 1.21	0.99 0.57, 1.69
	Low	0.76 0.49, 1.17	0.76 0.50, 1.15	0.70 0.46, 1.06	**0.62** **0.41, 0.95**	1.03 0.60, 1.75
	Low-low	**0.41** **0.24, 0.71**	0.83 0.51, 1.34	0.76 0.47, 1.23	**0.60** **0.37, 0.98**	1.05 0.57, 1.93
Type 2 Diabetes	High	1.00	1.00	1.00	1.00	1.00
	Medium	1.34 0.87, 2.05	1.29 0.85, 1.96	1.33 0.87, 2.01	1.27 0.83, 1.94	1.18 0.70, 2.00
	Low-med	1.20 0.72, 2.00	**1.71** **1.03, 2.85**	1.04 0.63, 1.71	1.26 0.76, 2.10	1.28 0.69, 2.40
	Low	0.90 0.58, 1.41	1.18 0.77, 1.81	1.34 0.87, 2.06	0.90 0.58, 1.39	0.81 0.46, 1.44
	Low-low	**0.60** **0.36, 0.98**	0.93 0.59, 1.47	0.82 0.52, 1.29	0.81 0.51, 1.28	0.86 0.47, 1.57
Heart Disease	High	1.00	1.00	1.00	1.00	1.00
	Medium	0.82 0.50, 1.32	0.72 0.45, 1.15	1.18 0.73, 1.89	1.13 0.70, 1.82	2.14 0.98, 4.70
	Low-med	0.90 0.55, 1.45	1.03 0.64, 1.65	**1.61** **1.00, 2.58**	1.32 0.82, 2.14	**4.30** **2.02, 9.14**
	Low	0.77 0.59, 1.28	0.92 0.56, 1.51	1.18 0.72, 1.94	1.29 0.78, 2.14	**3.16** **1.43, 6.94**
	Low-low	0.67 0.41, 1.11	0.72 0.44, 1.17	0.85 0.52, 1.38	0.94 0.54, 1.55	1.92 0.86, 4.31

CDRF[1] category	UIx[2] Score	Measured waist	Measured weight	Increased physical activity	Increased fruit and vegetables	Talked to doctor *(continued)*
	High	1.00	1.00	1.00	1.00	1.00
Overweight	Medium	0.85	0.97	1.18	1.20	1.24
		0.57, 1.26	0.65, 1.44	0.79, 1.76	0.80, 1.78	0.76, 2.02
	Low-med	**0.62**	0.81	1.02	0.72	0.55
		0.40, 0.95	0.54, 1.22	0.68, 1.55	0.47, 1.10	0.30, 1.00
	Low	0.71	0.79	0.98	1.07	1.04
		0.45, 1.12	0.51, 1.24	0.63, 1.53	0.68, 1.67	0.59, 1.83
	Low-low	**0.42**	0.57	0.77	0.74	1.08
		0.26, 0.67	0.37, 0.87	0.50, 1.18	0.48, 1.14	0.64, 1.85